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NOTICE OF PROJECT CHANGE
AREA NORTH OF CAUSEWAY STREET

Central Artery/Tunnel Project
Final Supplemental Environmental Impact Report

Boston, Massachusetts

E0EA #4325

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Submitted by the Massachusetts Highway Department
Prepared by Bechtel/Parsons Brinckerhoff
September, 1992

Massachusetts Highway Department
Central Artery/Tunnel

October 1, 1992

Dear Reader:

The Massachusetts Highway Department has developed a new proposal for the Charles River Crossing portion of the Central Artery/Tunnel Project. Enclosed is a copy of a Notice of Project Change (NPC) which describes this proposed design revision to the Charles River Crossing portion of the Central Artery (I-93)/Tunnel (I-90) Project. This document has been filed with the Massachusetts Executive Office of Environmental Affairs (EOEA) and is currently being reviewed by EOEA to determine what, if any, additional information is required to be provided by the Massachusetts Highway Department regarding the environmental impacts of this proposed project revision.

The public is invited to submit written comments on this document no later than November 20, 1992, to:

Ms. Susan Tierney, Secretary
Massachusetts Executive Office of
Environmental Affairs
100 Cambridge Street, 20th Floor
Boston, MA 02202
Attention: MEPA Unit

In the near future the Federal Highway Administration is expected to publish in the Federal Register a Notice of Intent to file a supplemental environmental statement regarding this revised Charles River Crossing in accordance with the National Environmental Policy Act (NEPA). Coordination will be made with appropriate Federal, State and local agencies, and interested public. Additional information will be provided to you regarding these federal activities.

If you have any questions, please call Chris Melendez at (617) 457-5516.

Sincerely,

MASSACHUSETTS HIGHWAY DEPARTMENT

Peter M. Zuk,
Project Director

EN-9.3.40
092-3187

One South Station • Boston • Massachusetts • 02110 • Phone 617-951-6000 • Fax 617-951-0897

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Table Of Contents

Page

S SUMMARY S-1

1 INTRODUCTION 1-1

2 DESCRIPTION OF REVISED CHARLES RIVER CROSSING 2-1

2.1 Description Of Revised Charles River Crossing And Comparison To FSEIS/R Proposed Action 2-1

2.2 Development Of The Revised Charles River Crossing 2-5
2.2.1 Environmental Review And Permit Process 2-5
2.2.2 MEPA Certificate Directives 2-7
2.2.3 Bridge Design Review Committee Process 2-8

2.3 Benefits Of Revised Charles River Crossing 2-15

3 CHANGES IN LONG-TERM ENVIRONMENTAL IMPACTS OF REVISED CHARLES RIVER CROSSING 3-1

3.1 Transportation And Traffic 3-1
3.1.1 Traffic Conditions 3-2
3.1.2 HOV Operations 3-5
3.1.3 Parking Facilities 3-5
3.1.4 Public Transportation And Pedestrian And Bicycle Circulation 3-5
3.1.5 North Station/South Station Rail Link 3-5

3.2 Air Quality 3-6
3.2.1 Qualitative Assessment 3-6

3.3 Noise And Vibration 3-7
3.3.1 Traffic Noise Levels 3-7
3.3.2 Ventilation Building Noise Levels 3-8
3.3.3 Mitigation Measures 3-9

3.4 Energy 3-9

3.5 Economic Characteristics 3-9

3.6 Land Use And Neighborhood Characteristics 3-9
3.6.1 North Of The Charles River 3-9
3.6.2 South Of The Charles River 3-10
3.6.3 Right-Of-Way 3-10

Table Of Contents (Cont.)

Page

3.7 Visual Characteristics 3-11
  3.7.1 North Of The Charles River 3-11
  3.7.2 South Of The Charles River 3-11

3.8 Parklands 3-13
  3.8.1 North Of The Charles River 3-14
  3.8.2 South Of The Charles River 3-15

3.9 Historic Resources 3-16
  3.9.1 Tower A 3-16
  3.9.2 Charles River Basin District 3-16
  3.9.3 100 Nashua Street 3-16
  3.9.4 Causeway/North Washington Streets District 3-16
  3.9.5 Charles River Railroad Draw 1 3-16
  3.9.6 Other Effects Due To Design Change 3-17

3.10 Archaeological Resources 3-17

3.11 Utilities 3-17
  3.11.1 Utility Relocations 3-17
  3.11.2 Boston Thermal Minot Station Displacement 3-17

3.12 Water Quality And Fisheries 3-17
  3.12.1 Water Quality 3-17
  3.12.2 Fisheries 3-18

3.13 Wetlands And Waterways 3-19
  3.13.1 Wetlands 3-19
  3.13.2 Waterways 3-20
  3.13.3 Navigation 3-21

3.14 Floodplains 3-22

3.15 Vegetation And Wildlife 3-22

4 CHANGES IN TEMPORARY CONSTRUCTION PERIOD IMPACTS OF REVISED CHARLES RIVER CROSSING 4-1

4.1 Construction Plan 4-1
  4.1.1 River Tunnel 4-1
  4.1.2 Landside Tunnels 4-3

4.2 Materials Disposal 4-4
  4.2.1 Material Quality 4-4
  4.2.2 Beneficial Reuse Or Disposal Options 4-4

Table Of Contents (Cont.)

Page

4.3 Transportation And Traffic 4-5
- 4.3.1 Potential Traffic Detours 4-5
- 4.3.2 Parking Facilities 4-6
- 4.3.3 Public Transportation And Pedestrian And Bicycle Circulation 4-6

4.4 Air Quality 4-6

4.5 Noise And Vibration 4-7

4.6 Energy 4-7

4.7 Economic Characteristics 4-7

4.8 Land Use And Neighborhood Characteristics 4-7

4.9 Relocations 4-8

4.10 Parklands 4-8

4.11 Historic Resources 4-8
- 4.11.1 Tower A 4-8
- 4.11.2 Charles River Basin District 4-8
- 4.11.3 100 Nashua Street 4-8
- 4.11.4 Causeway/North Washington Streets District 4-8
- 4.11.5 Charles River Railroad Draw 1 4-9

4.12 Archaeological Resources 4-9

4.13 Utilities 4-9

4.14 Water Quality And Fisheries 4-9
- 4.14.1 Bridge Piers 4-9
- 4.14.2 Tunnel 4-9
- 4.14.3 Fisheries 4-9

4.15 Wetlands And Waterways 4-10
- 4.15.1 Wetlands 4-10
- 4.15.2 Waterways 4-11
- 4.15.3 Navigation 4-12

Table Of Contents (Cont.)

Page

5 CHANGES IN PERMITS/APPROVALS OF REVISED CHARLES RIVER CROSSING 5-1

- 5.1 FEDERAL AGENCIES 5-1
  - 5.1.1 Environmental Protection Agency 5-1
  - 5.1.2 Federal Aviation Administration 5-1
  - 5.1.3 U.S. Army Corps Of Engineers 5-1
  - 5.1.4 U.S. Coast Guard 5-1
- 5.2 STATE AGENCIES 5-2
  - 5.2.1 Department Of Environmental Protection, Divison Of Water Pollution Control 5-2
  - 5.2.2 Department Of Environmental Protection, Division Of Waterways and Wetlands 5-2
  - 5.2.3 Department Of Environmental Protection, Division Of Air Quality Control 5-2
  - 5.2.4 Executive Office Of Environmental Affairs, Office Of Coastal Zone Management 5-2
- 5.3 LOCAL AGENCIES 5-2
  - 5.3.1 Boston Department of Environment, Boston Conservation Commission, Cambridge Conservation Commission 5-2

6 ISSUES SUBJECT TO FURTHER EVALUATION 6-1

- 6.1 Traffic 6-1
  - 6.1.1 Changes In Traffic Analysis 6-1
  - 6.1.2 Additional Traffic Design/Engineering Analysis Needs 6-1
- 6.2 Air Quality 6-2
- 6.3 Noise And Vibration 6-2
- 6.4 Historic Resources 6-3
- 6.5 Wetlands And Waterways 6-3
- 6.6 Materials Disposal 6-3

List Of Tables

Table No.	Title	After Page
3.1	Charles River Crossing Screenline Traffic Volumes	3-6
3.2	Leverett Circle - Charles Street Extension - Charles Circle Traffic Volumes	3-6
3.3	Sum Of Intersection Traffic Volumes	3-6
3.4	Intersection Levels Of Service	3-6
3.5	Vehicle Miles Of Travel (VMT) 2010	3-6
3.6	Site Description Of Noise Receptor Locations	3-8
3.7	Existing Utility Lines Affected By The Revised Charles River Crossing	3-18
3.8	Comparison Of FSEIS/R Proposed Action To Revised Charles River Crossing Permanent Impacts To Wetlands Resource Areas	3-20
4.1	Comparison Of FSEIS/R Proposed Action To Revised Charles River Crossing Total Construction Period Impacts To Wetlands Resource Areas	4-12

List Of Figures

Figure No.	Title	After Page
	SUMMARY	
S.1	View of Model From North Washington Street Bridge. Revised Charles River Crossing and FSEIS/R Proposed Action.	S-7
S.2	View of Model from North Looking South. Revised Charles River Crossing and FSEIS/R Proposed Action.	S-7
S.3	View of Model from South Looking North. Revised Charles River Crossing and FSEIS/R Proposed Action.	S-7
S.4	View of Model from East Looking West. Revised Charles River Crossing and FSEIS/R Proposed Action.	S-7
S.5	View of Model Looking West from East. Revised Charles River Crossing and FSEIS/R Proposed Action.	S-7
S.6	Comparison of Revised Charles River Crossing and FSEIS/R Proposed Action.	S-7
S.7	Section Looking North from South Bank. Revised Charles River Crossing and FSEIS/R Proposed Action.	S-7
S.8	Section Looking South from Charles River North Bank. Revised Charles River Crossing and FSEIS/R Proposed Action.	S-7
S.9	Elevation Views of Charles River Bridge Looking West. Revised Charles River Crossing and FSEIS/R Proposed Action.	S-7
S.10	View of Charles River Bridges from South Bank Looking West. Revised Charles River Crossing and FSEIS/R Proposed Action.	S-7
S.11	View of Charles River Bridges from North Bank Looking East. Revised Charles River Crossing and FSEIS/R Proposed Action.	S-7
S.12	Traffic Movements from Tobin Bridge (Route 1 SB). Revised Charles River Crossing.	S-7
S.13	Traffic Movements from Tobin Bridge (Route 1 SB). FSEIS/R Proposed Action.	S-7

List Of Figures (Cont.)

Figure No.	Title	After Page
S.14	Traffic Movements from I-93 SB. Revised Charles River Crossing.	S-7
S.15	Traffic Movements from I-93 SB. FSEIS/R Proposed Action.	S-7
S.16	Section at Loop Ramps. Revised Charles River Crossing and FSEIS/R Proposed Action.	S-7
S.17	Section at Loop Ramps. Revised Charles River Crossing and FSEIS/R Proposed Action.	S-7
S.18	Traffic Movements from I-93 NB. Revised Charles River Crossing.	S-7
S.19	Traffic Movements from I-93 NB. FSEIS/R Proposed Action.	S-7
S.20	Traffic Movements from Storrow Drive. Revised Charles River Crossing.	S-7
S.21	Traffic Movements from Storrow Drive. FSEIS/R Proposed Action.	S-7
	Main Report	
1.1	Project Location. Area North of Causeway Street.	1-2
2.1	CIP 8.1D Revision 3	2-14
2.2	CIP 8.1D Revision 4	2-14
2.3	CIP 8.1D Revision 5 (Revised Charles River Crossing)	2-14
2.4	FSEIS/R Proposed Action	2-14
3.1	Hazardous Cargo Route. Revised Charles River Crossing.	3-4
3.2	Hazardous Cargo Route. FSEIS/R Proposed Action.	3-4
3.3	North Station To South Station Rail Link Potential Location. Revised Charles River Crossing.	3-6

List Of Figures (Cont.)

Figure No.	Title	After Page
3.4	North Station To South Station Rail Link Profile. Revised Charles River Crossing.	3-6
3.5	Location Of Sensitive Noise Receptors. Revised Charles River Crossing.	3-8
3.6	Location Of Sensitive Noise Receptors. FSEIS/R Proposed Action.	3-8
3.7	Historic Resources. Revised Charles River Crossing.	3-16
3.8	Historic Resources. FSEIS/R Proposed Action.	3-16
4.1	Locations For Materials Processing Operations Possible Locations. Revised Charles River Crossing.	4-6

NOTICE OF PROJECT CHANGE IN AREA NORTH OF CAUSEWAY STREET

CENTRAL ARTERY/TUNNEL PROJECT FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT REPORT

BOSTON, MA
EOEA #4325

PROJECT PROPONENT: MASSACHUSETTS HIGHWAY DEPARTMENT

DATE OF SECRETARY'S CERTIFICATE: JANUARY 2, 1991

SUMMARY

This Notice of Project Change (NPC) describes design changes in the Area North of Causeway Street and the potential impacts of these changes relating to the Proposed Action described in the Final Supplemental Environmental Impact Statement/Report (FSEIS/R). This NPC addresses the complexity of the Central Artery/Tunnel Project in the Area North of Causeway Street that involves regional highway linkage to the Central Artery, I-93, Route 1, Storrow Drive and to local connections.

The Revised Charles River Crossing in the Area North of Causeway Street is different from the Proposed Action in the FSEIS/R (Scheme Z Modified), although it includes elements of a variant described in the FSEIS/R (Scheme T Modified). The design is based on the recommendations of the Bridge Design Review Committee, the Executive Office of Transportation and Construction (EOTC), Massachusetts Highway Department (the Department), the City of Boston, and the City of Cambridge. The Bridge Design Review Committee unanimously voted to support the design of the Revised Charles River Crossing on September 29, 1992. This Revised Charles River Crossing is based on a conceptual design which will be further developed and refined through subsequent environmental permit processes. The Revised Charles River Crossing consists of the following changed elements, as compared to the FSEIS/R Proposed Action.

I-93 Mainlines.

- In the Revised Charles River Crossing, the Interstate 93 (I-93) mainline highway will cross over the Charles River on a single bridge comprising four lanes each in northbound and southbound directions and an additional two lanes on the western side of the mainline bridge to carry I-93/Route 1 southbound traffic to Leverett Circle/Storrow Drive, for a total of 10 lanes over the river. By comparison, the FSEIS/R Proposed Action has two mainline bridges containing five lanes in each direction plus one six-lane (three over three) double-decked structure to accommodate all traffic movements to Leverett Circle/Storrow Drive for a total of 16 lanes over the river. As a result of this change, the Revised Charles River Crossing bridge will be reduced to a width of approximately 162 feet, which is 113 feet narrower than the three bridges in the FSEIS/R Proposed Action. The Revised Charles River Crossing will remove the double-crossings on the

I-93 mainline improving operational efficiency and reducing vehicle miles of travel (VMT). This design change is shown in Figures S.5 through S.7.

Bridge Structure Type.

- The Revised Charles River Crossing bridge will be a cable-stayed structure with a single twin-legged tower approximately 285 feet in height located along the north side of the Charles River. The FSEIS/R Proposed Action includes two cable-stayed bridges with towers on both sides of the river each approximately 330 feet in height, plus a double-decked bridge that varies in type and profile with the mainline bridge. The design change will improve the visual aesthetics of the Charles River Basin and parkland along the north and south banks of the river by simplifying the design and reducing the width of the crossing, as shown in Figures S.8 through S.10.

Route 1 (Tobin Bridge) - Southbound.

The traffic movements of the Revised Charles River Crossing and the FSEIS/R Proposed Action are shown in Figures S.11 and S.12, respectively.

- Travelling south on Route 1 (Tobin Bridge) located in Charlestown, the traffic movement to Storrow Drive and I-93 southbound in both the Revised Charles River Crossing and the FSEIS/R Proposed Action is accommodated by viaduct connections with local access connections at Leverett Circle. The Revised Charles River Crossing will have one viaduct loop and the FSEIS/R Proposed Action has two separate viaduct loops.

- Both the Revised Charles River Crossing and the FSEIS/R Proposed Action provide regional connections to the north on viaduct with local access provided to New Rutherford Avenue and Charlestown. The Revised Charles River Crossing also will provide direct local access to Boston Sand & Gravel Company, whereas the FSEIS/R Proposed Action provides no direct access to Boston Sand & Gravel Company.

Traffic movements from Route 1 (Tobin Bridge) southbound to regional and local connections are similar, with the exception that the Revised Charles River Crossing will provide direct local access to Boston Sand & Gravel Company, thereby removing trucks associated with this operation off local streets in Charlestown.

I-93 Southbound.

The traffic movements of the Revised Charles River Crossing and the FSEIS/R Proposed Action are shown in Figures S.13 and S.14, respectively.

- The Revised Charles River Crossing and the FSEIS/R Proposed Action provide traffic movements to Storrow Drive on viaducts and bridges. Both provide local access to east Cambridge and the O'Brien Highway, and downtown Boston via Nashua Street. The Revised Charles River Crossing will provide this movement parallel to the I-93 southbound mainline. The FSEIS/R Proposed Action provides this movement in an indirect route around the viaduct loop connections through east Cambridge, which adds a loop ramp to the interchange.

- The Revised Charles River Crossing will accommodate the I-93 southbound traffic to Route 1 (Tobin Bridge) northbound via a surface road connection under the I-93 southbound mainline with an at-grade signalized intersection that provides local access to New Rutherford Avenue and Boston Sand & Gravel Company. The FSEIS/R Proposed Action provides I-93 southbound traffic to Route 1 (Tobin Bridge) northbound by an indirect route around the viaduct connections through east Cambridge, which adds a loop ramp to the interchange. The FSEIS/R provides local access to Charlestown at City Square.

- The Revised Charles River Crossing will provide an exclusive High-Occupancy Vehicle (HOV) lane on I-93 southbound from Sullivan Square in Somerville to the north bank of the Charles River. The FSEIS/R Proposed Action does not provide for a dedicated HOV lane.

Traffic movements from I-93 southbound to areas to the north and west in the Revised Charles River Crossing will be provided on a structure in east Cambridge that will be less massive and visually intrusive due to the elimination of several loop ramps to the interchange in east Cambridge (see figures S.15 and S.16). The addition of the dedicated HOV lane will improve the operational efficiency of the regional highway network.

I-93 Northbound.

The traffic movements of the Revised Charles River Crossing and the FSEIS/R Proposed Action are shown in Figures S.17 and S.18, respectively.

- The Revised Charles River Crossing will provide traffic movements from I-93 northbound to Storrow Drive westbound by direct tunnel through the North Station area. The FSEIS/R Proposed Action provides this movement by viaduct crossing northbound over the Charles River on the mainline bridge then reversing direction on a loop ramp that crosses southbound over the Charles River on the lower level of the double-decked bridge and through North Station connecting to Storrow Drive. This adds two lanes to the river crossing and another viaduct loop ramp to the interchange in east Cambridge/Charlestown.

- Both the Revised Charles River Crossing and the FSEIS/R Proposed Action provide local connections to east Cambridge and downtown Boston on the south side of the river at Leverett Circle.

- The Revised Charles River Crossing will accommodate I-93 northbound traffic to Route 1 (Tobin Bridge) northbound in a tunnel through North Station and under the Charles River. The FSEIS/R Proposed Action provides this movement by viaduct north of the Charles River, adding another loop ramp to the interchange in east Cambridge/Charlestown.

- North of the Charles River, the Revised Charles River Crossing will provide local access to east Cambridge and Charlestown at New Rutherford Avenue north of the Gilmore Bridge. This movement will remove traffic congestion from the City Square area. The FSEIS/R Proposed Action provides local access at City Square.

- The Revised Charles River Crossing will provide local I-93 access from downtown Boston at New Sudbury Street. The FSEIS/R Proposed Action does not include a local downtown Boston access ramp from Government Center.

The Revised Charles River Crossing will provide traffic movements from I-93 northbound to Storrow Drive through a direct tunnel connection as opposed to the double-crossing of the I-93 mainline bridge in the FSEIS/R Proposed Action, which will reduce VMT. The inclusion of a local downtown Boston access ramp at New Sudbury Street in the Revised Charles River Crossing will improve the operational efficiency of the regional network system. In addition, the Revised Charles River Crossing will decrease local congestion in Charlestown, specifically in the vicinity of City Square, by the relocation of the I-93 northbound to New Rutherford Avenue movement to a location north of Gilmore Bridge.

Storrow Drive.

The traffic movements of the Revised Charles River Crossing and the FSEIS/R Proposed Action are shown in Figures S.19 and S.20, respectively.

- The Revised Charles River Crossing will provide traffic movements from Storrow Drive to I-93 southbound with an at-grade intersection at Leverett Circle, similar to existing conditions. Southbound traffic flow will proceed down a ramp into a tunnel under 100 Nashua Street (the Registry of Motor Vehicles building) and the Massachusetts Bay Transporation Authority (MBTA) Commuter Rail railroad tracks at North Station, and join I-93 just north of Causeway Street. In the FSEIS/R Proposed Action, this Storrow Drive to I-93 southbound requires a northbound traffic movement first on the upper level of the double-decked bridge, across the Charles River, before looping back on a viaduct connection to I-93 southbound which crosses the Charles River on the mainline bridge. As a result, the FSEIS/R Proposed Action adds two additional lanes to the river crossing and one loop ramp to the interchange in east Cambridge/Charlestown.

- The Revised Charles River Crossing will provide traffic movements from Storrow Drive to I-93 northbound and Route 1 (Tobin Bridge) northbound with an at-grade intersection at Leverett Circle, similar to existing conditions. Northbound traffic flow will proceed down a ramp into a tunnel under 100 Nashua Street, loop around northwesterly under the current site of the Minot Station steam generating plant, beneath the MBTA relocated Green Line and under the Charles River in a three-lane tunnel. The FSEIS/R Proposed Action accommodates this movement on the upper level of a double-decked bridge over the Charles River and a loop ramp, which adds another loop ramp to the interchange in east Cambridge/Charlestown.

- The Revised Charles River Crossing and the FSEIS/R Proposed Action include local on-ramps to I-93/Route 1 at Leverett Circle.

The Revised Charles River Crossing will provide access at Lomasney Way/Merrimac Street through the Charles River three-lane tunnel to I-93 and Route 1 northbound. This will allow local downtown Boston traffic another access to points north via the Congress Street arterial. Access from Storrow Drive to I-93 southbound will be more direct in the Revised Charles River Crossing, as opposed to the double-crossing of the I-93 mainline bridge in the FSEIS/R Proposed Action.

Ventilation Building.

- The three-lane northbound tunnel under the Charles River and the land tunnels under the North Station Commuter Rail facility, the Spaulding Rehabilitation Hospital site, and Nashua Street will need one ventilation building located north of the new Boston Garden site for the Revised Charles River Crossing. These tunnels require the relocation of Spaulding Rehabilitation Hospital, which provides an opportunity for substantial open space expansion along the south bank of the Charles River. The FSEIS/R Proposed Action does not include any ventilation buildings in this area because it has no tunnels north of Causeway Street.

The Long-Term Benefits of Revised Charles River Crossing.
The Revised Charles River Crossing will have the following substantial benefits:

- Traffic will decrease on the local street network in the Area North of Causeway Street and over the Charles River on the mainlines, yielding a 2.0 percent reduction in VMT in the Artery/Tunnel Project area, a reduction of approximately 77,000 VMT daily, or 32 million VMT yearly.
- Direct access from downtown to I-93 northbound will be provided at New Sudbury Street.
- A dedicated HOV lane will be added on I-93 southbound north of the river.
- Direct access to New Rutherford Avenue and to the I-93 system will be provided for Boston Sand & Gravel Company, eliminating the need for concrete trucks to use the local streets in City Square.
- Energy consumption will decrease with the reduction in VMT and better traffic operations.
- Air quality levels will improve due to reduced VMT and improved levels of service at key intersections.
- Noise levels will be lower at existing Charlestown residences and the future North Point development site due to the river tunnel and the narrowing of the bridge structure. In addition, construction-related noise impacts will be minimized due to the proposed change in land use (i.e., relocation of Spaulding Rehabilitation Hospital).
- The Charles River mainline crossing will decrease from three bridges to one thereby reducing the net deck width by approximately 113 feet. In addition, there will be one

pier in the river (which is the west leg of the north tower of the cable-stayed bridge) rather than 11 piers. These design changes will reduce shading of the water surface and substantially improve navigational operations.

- The overall complex of viaducts with attendant piers, columns, and signs will be reduced in the Cambridge/Charlestown area which will allow the driver to negotiate the interchange with a greater sense of certainty.
- Visual benefits will occur with less massive structures, including the narrower bridge, shorter towers, fewer piers in the river, and expanded open space/development opportunities due to the use of tunnels.
- Long-range impacts on Section 4(f) parklands will be reduced due to a less intrusive ramp structure and a narrower river bridge.
- The Projectwide Wetlands and Waterways Mitigation Program has potential to yield major increases in usable open water areas, including waterways.
- The opportunity for attractive, clear passage for pedestrians and bicyclists along the banks of the Charles River will be substantially improved.

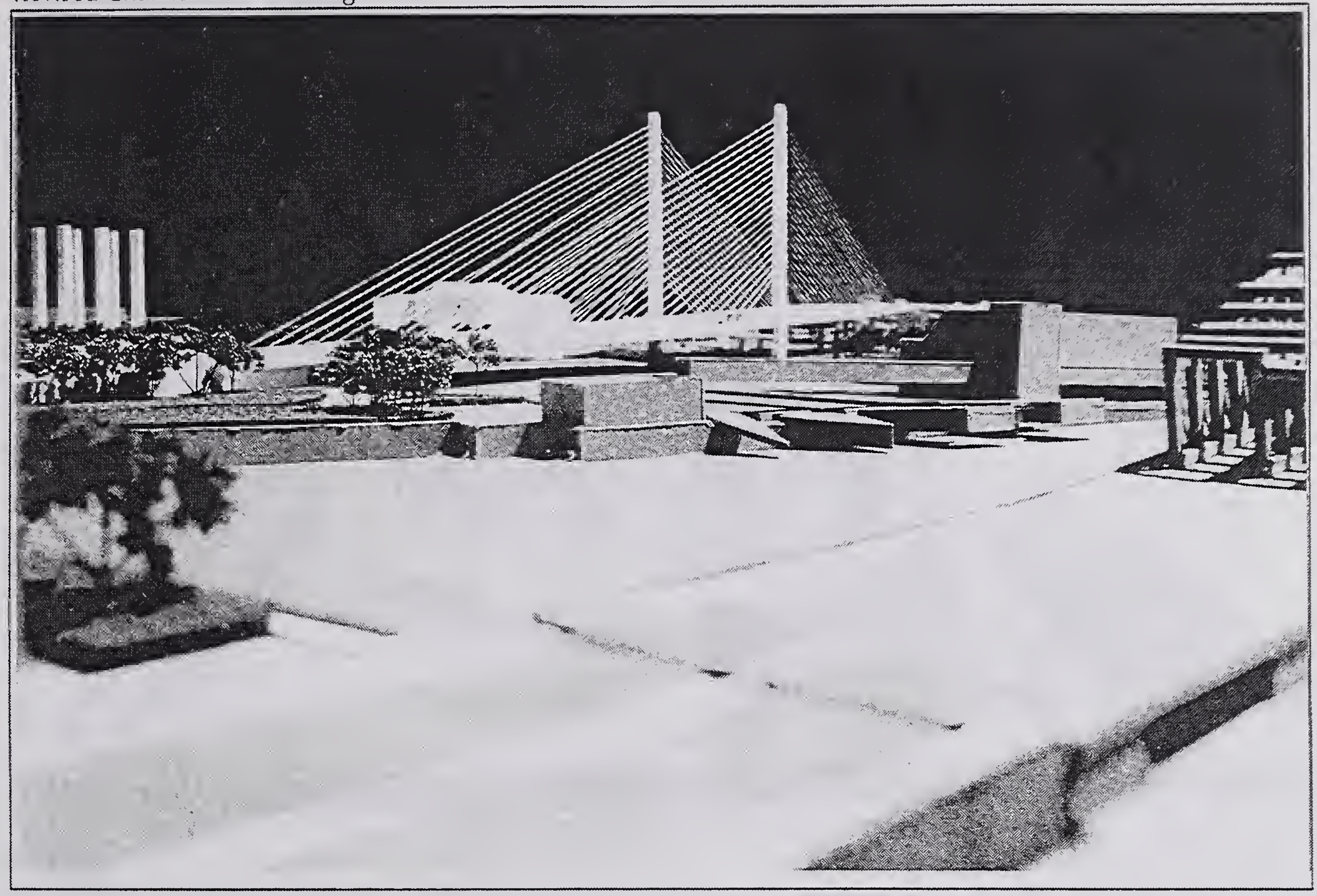
Conclusion. The Revised Charles River Crossing represents the results of an extensive effort to fulfill the mandates of the Massachusetts Environmental Policy Act Certificate for the FSEIR and the committments of the Federal Highway Administration Record of Decision for the FSEIS. Following an intensive study of alignment options, this effort produced a Revised Charles River Crossing design which will be environmentally, visually, and operationally superior to the FSEIS/R Proposed Action.

The Revised Charles River Crossing will offer additional long-term benefits that the FSEIS/R Proposed Action does not; however, its short-term construction period impacts may require additional mitigation measures because of the potential impacts associated with the added river tunnel construction. For a more comprehensive comparison of long-term and short-term (construction) impacts of the Revised Charles River Crossing and the FSEIS/R Proposed Action, refer to Chapters 3 and 4, respectively, of this NPC.

The Revised Charles River Crossing greatly simplifies the design of the project in the Area North of Causeway Street. An important permanent effect of the Revised Charles River Crossing will be the elimination of the complex maze of ramps to the north of the Charles River of the FSEIS/R Proposed Action that are so visually and physically intrusive to the neighborhoods of east Cambridge and Charlestown. The reduction of the I-93 mainline crossings over the Charles River to a single deck, single span bridge which is approximately 113 feet narrower that the FSEIS/R Proposed Action structure creates an attractive gateway to the cities of Boston and Cambridge, as well as improve navigation for pleasure craft in the Charles River Basin. The Revised Charles River Crossing eliminates the double-crossing of the Charles River that is potentially confusing to the motorist and reduces VMT. Improved local access such as the New Sudbury Street on-ramp to I-93 northbound, the relocation of the I-93 northbound off-ramp to New Rutherford Avenue and a new at-grade intersection near Boston Sand & Gravel Company will improve traffic operations on the local and regional network, while also reducing VMT. The reduction in VMT will improve the operational efficiency of the roadway network and improve air quality emissions. The addition of a dedicated HOV lane will also improve the operational efficiency of the roadway network. The reduction of structure along the north and south banks of the Charles River will make more parkland available for pedestrians and bicyclists, and promote the visual continuity between the Charles River Esplanade and the Lower Charles River Basin.

For copies of this document, please contact Christopher Melendez, Bechtel/Parsons Brinckerhoff, One South Station, Boston, MA 02110, telephone (617) 457-5516.

Revised Charles River Crossing



FSEIS/R Proposed Action

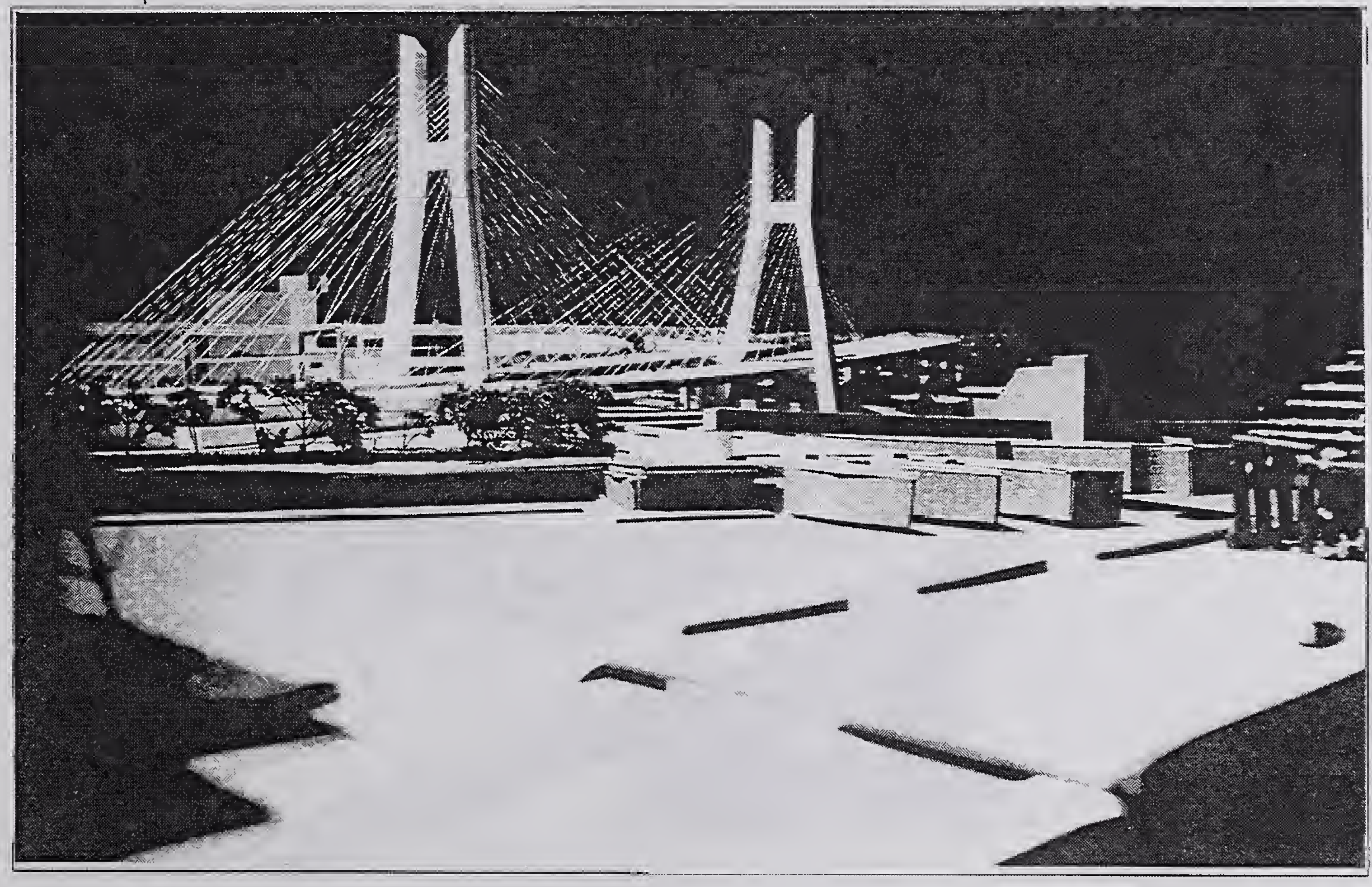
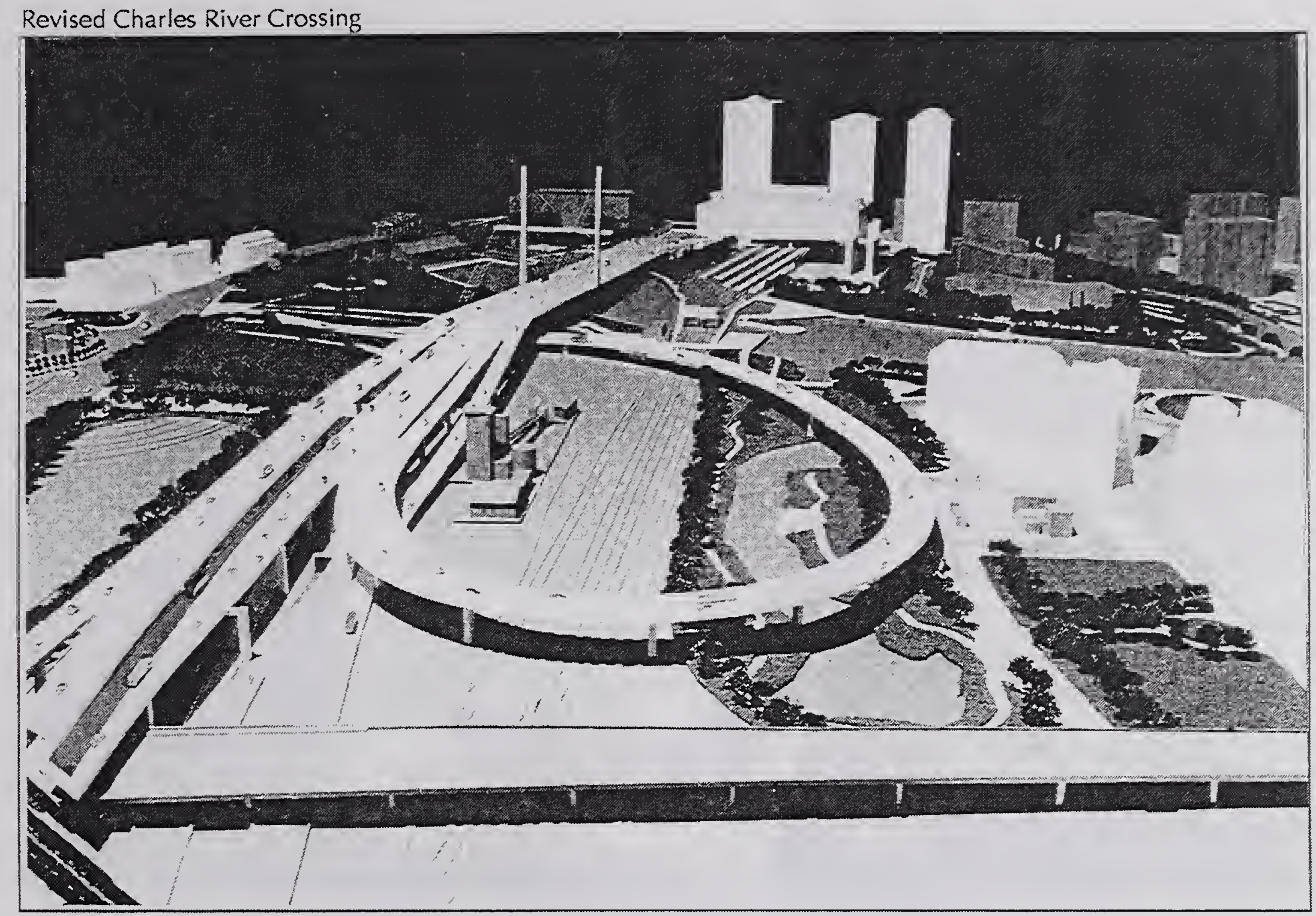


Figure S.1

View of Model from North Washington Street Bridge.
Revised Charles River Crossing and FSEIS/R Proposed Action.

Revised Charles River Crossing



FSEIS/R Proposed Action

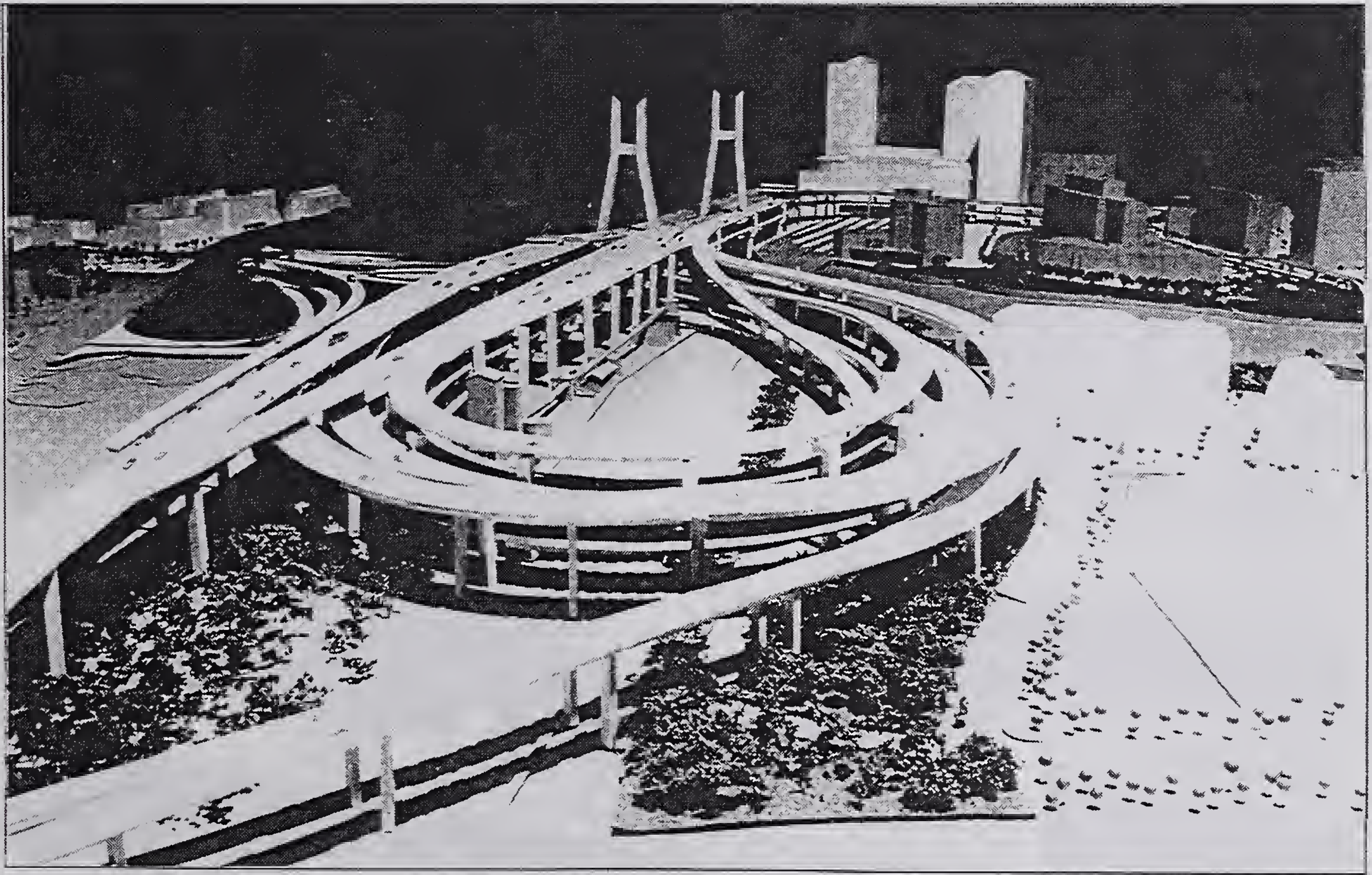
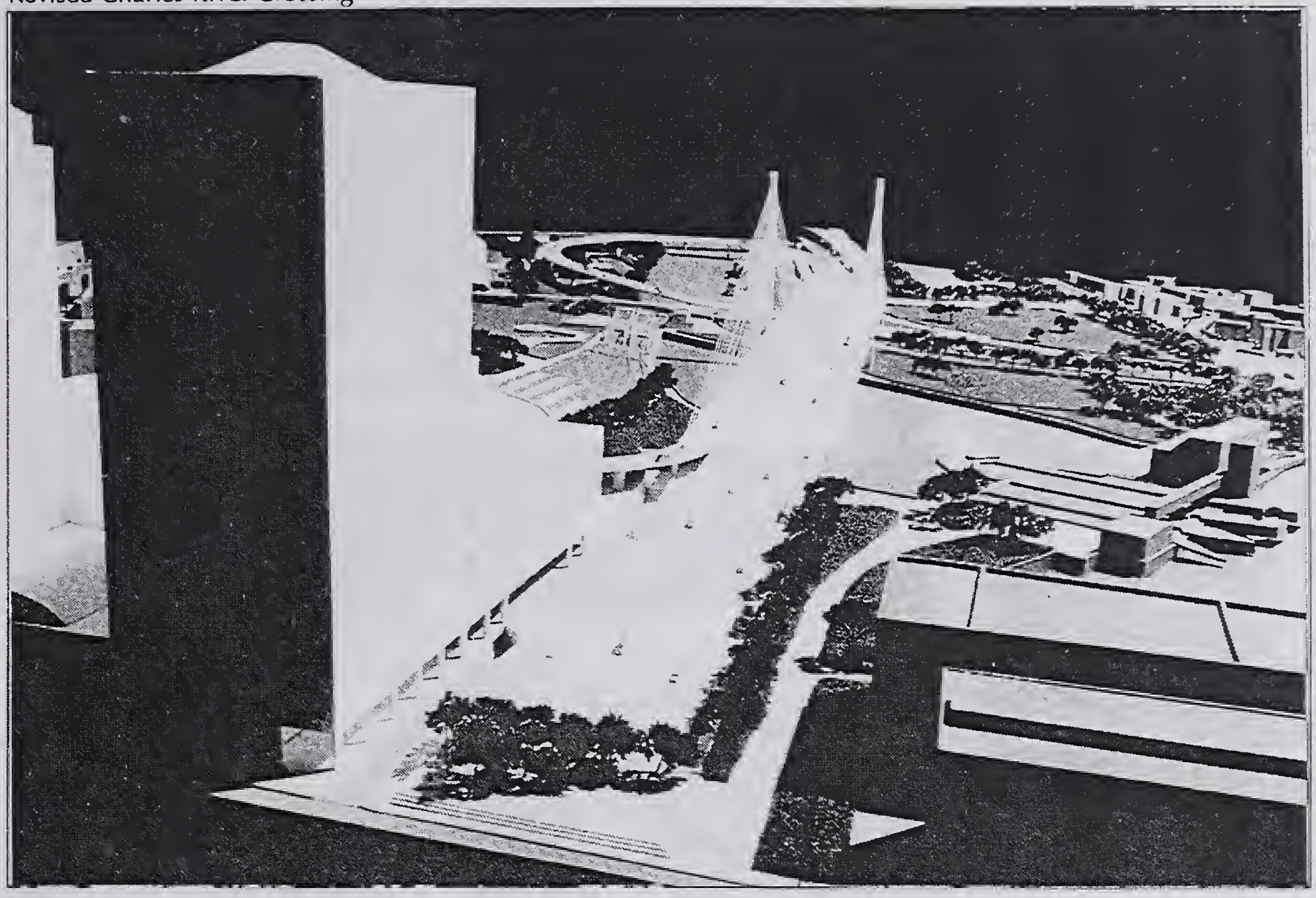


Figure S.2

View of Model from North Looking South.
Revised Charles River Crossing and FSEIS/R Proposed Action.

Revised Charles River Crossing



FSEIS/R Proposed Action

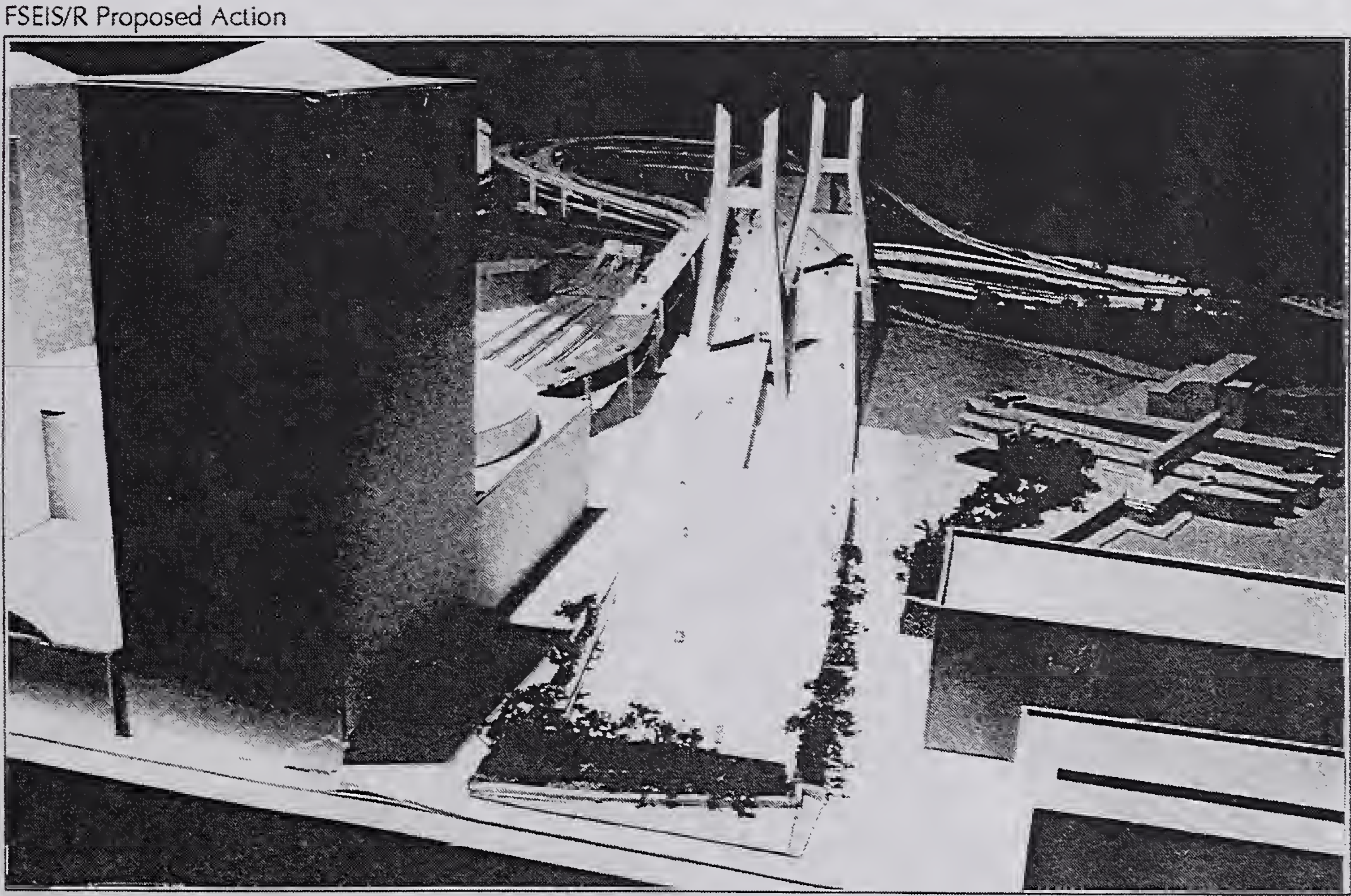
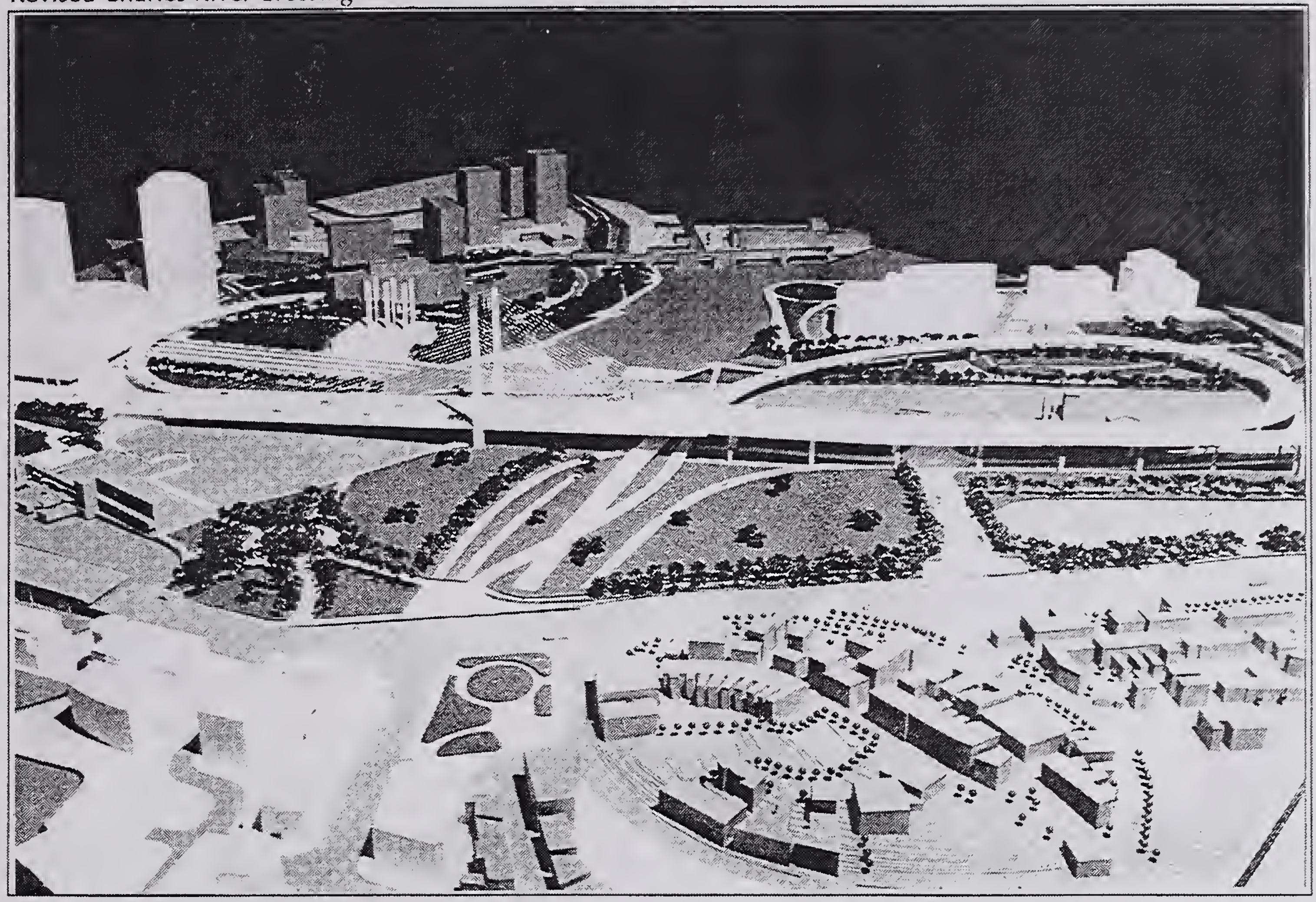


Figure S.3

View of Model from South Looking North.
Revised Charles River Crossing and FSEIS/R Proposed Action.

Revised Charles River Crossing



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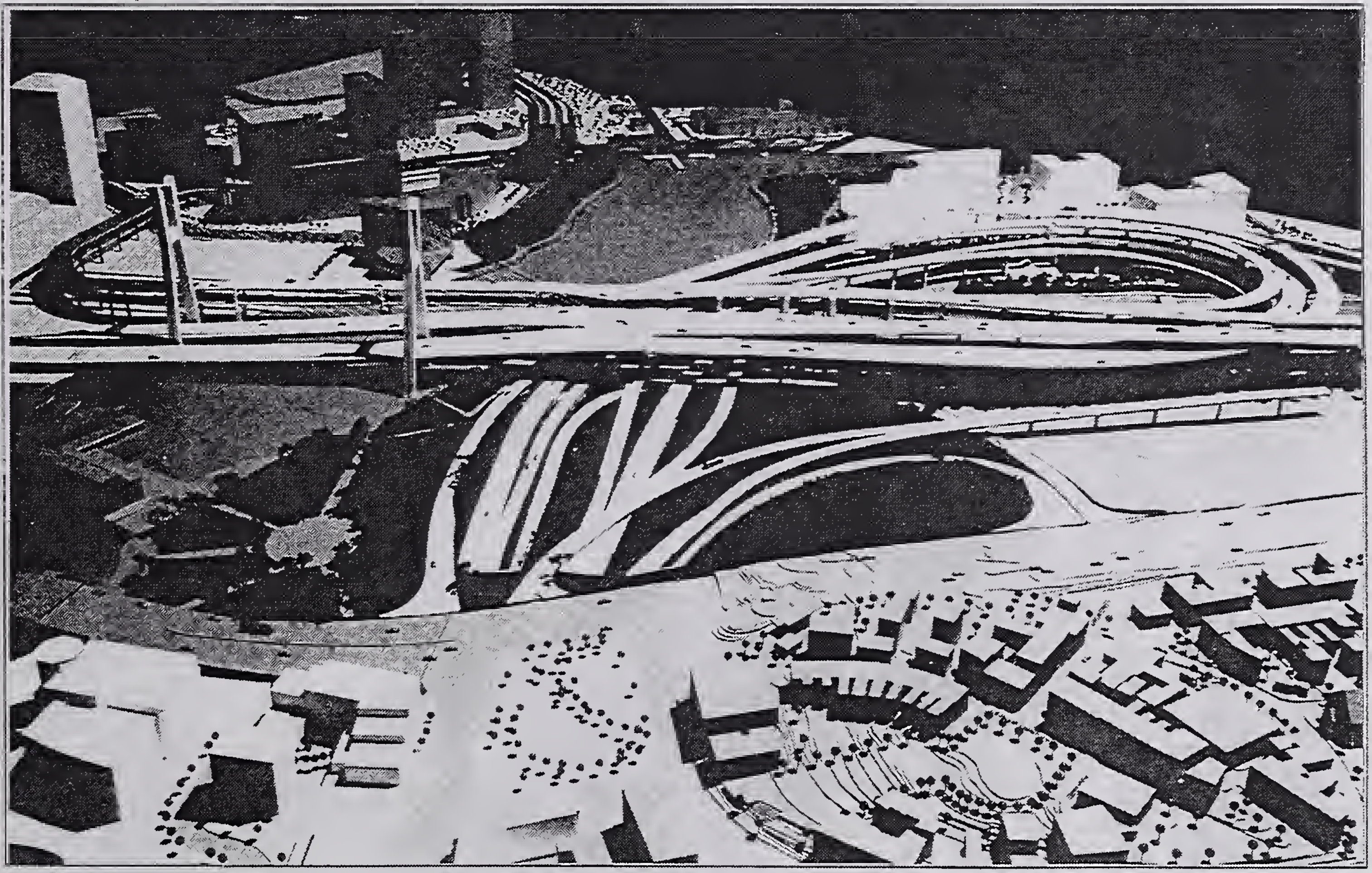
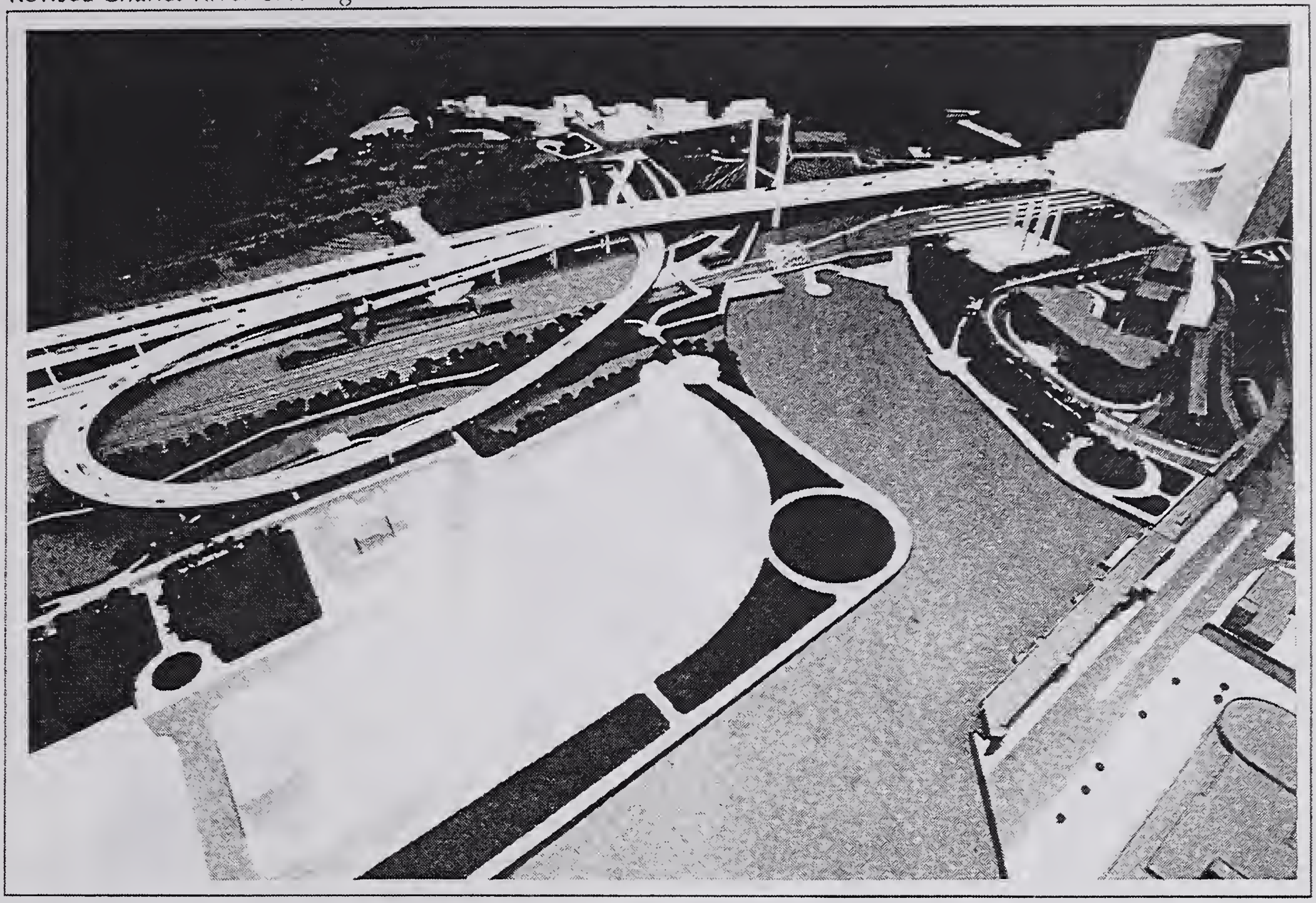


Figure S.4

View of Model from East Looking West.
Revised Charles River Crossing and FSEIS/R Proposed Action.

Revised Charles River Crossing



FSEIS/R Proposed Action

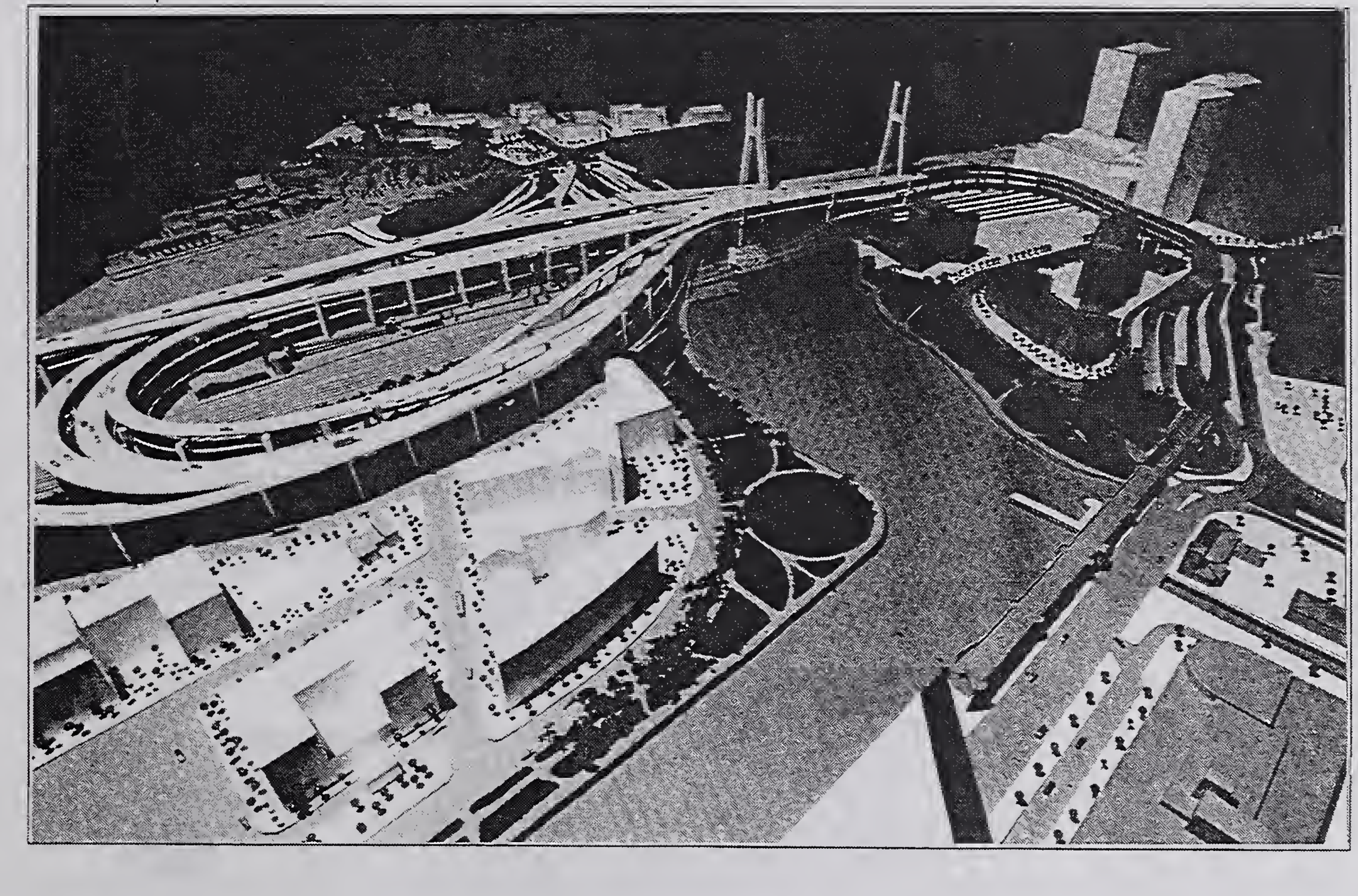
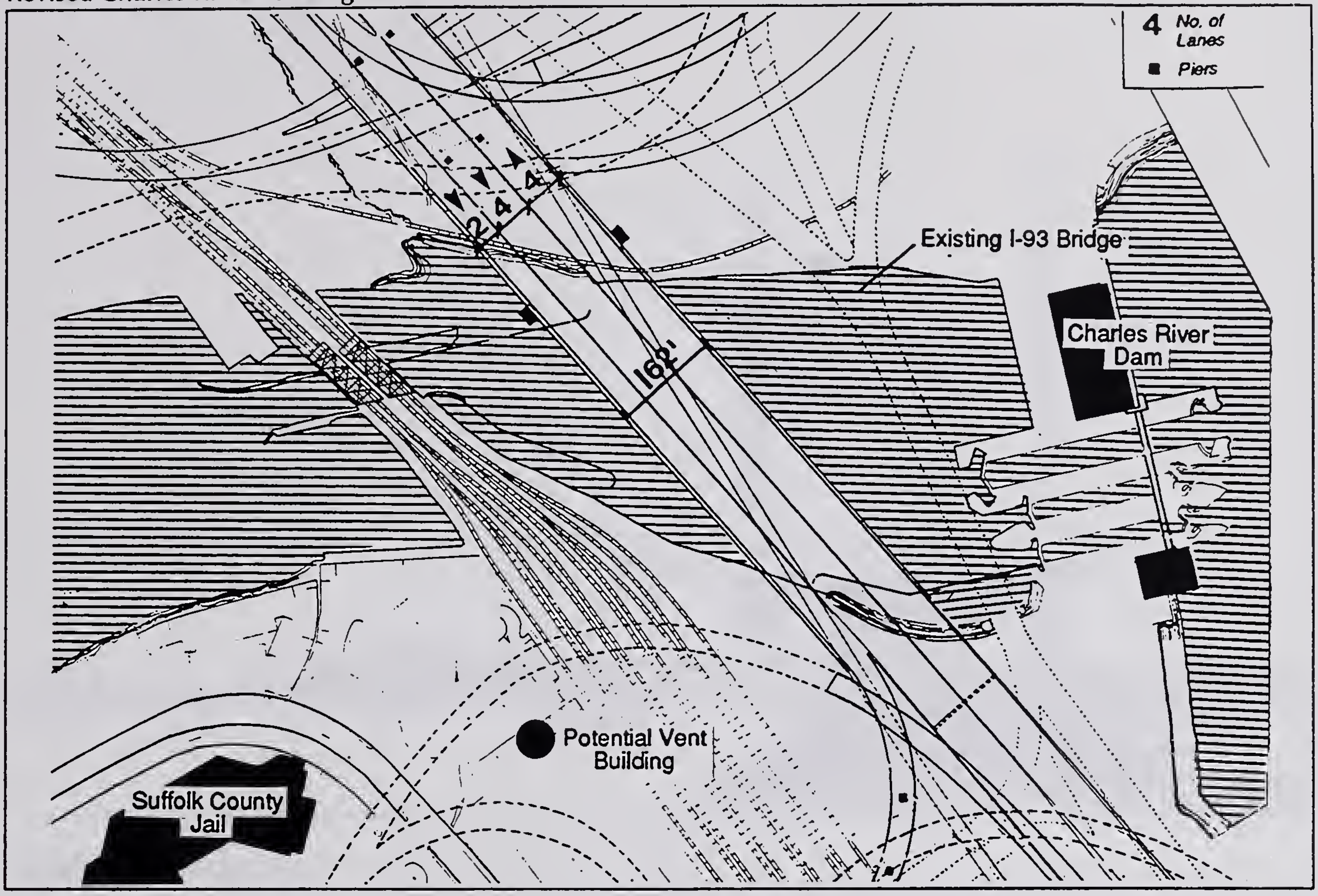


Figure S.5

View of Model from West Looking East.
Revised Charles River Crossing and FSEIS/R Proposed Action.

Revised Charles River Crossing



FSEIS/R Proposed Action

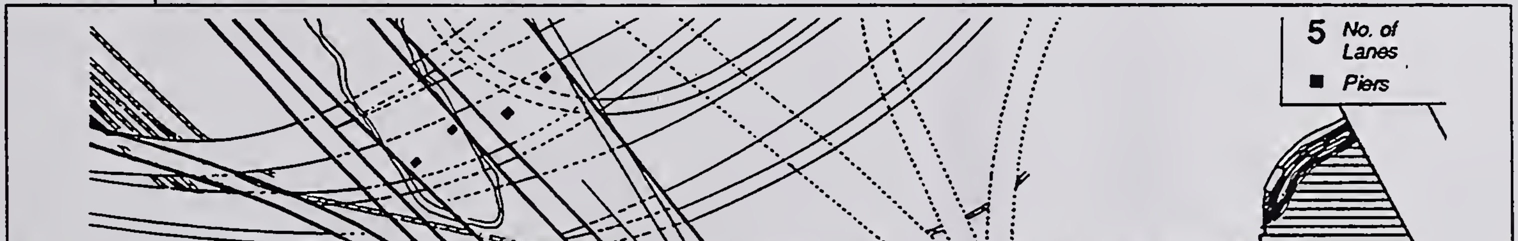
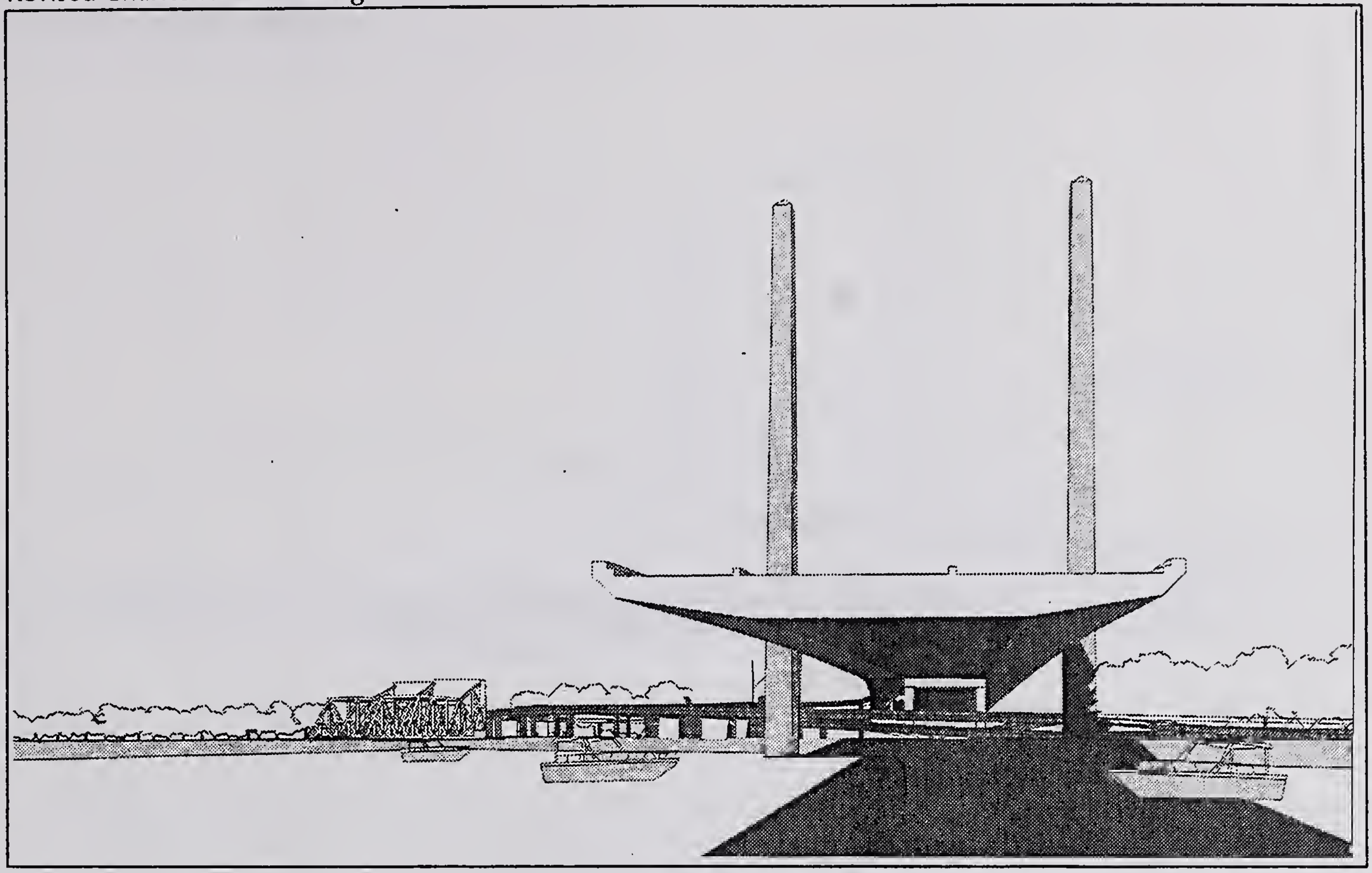


Figure S.6

Comparison of Revised Charles River Crossing and FSEIS/R Proposed Action.

Revised Charles River Crossing



FSEIS/R Proposed Action

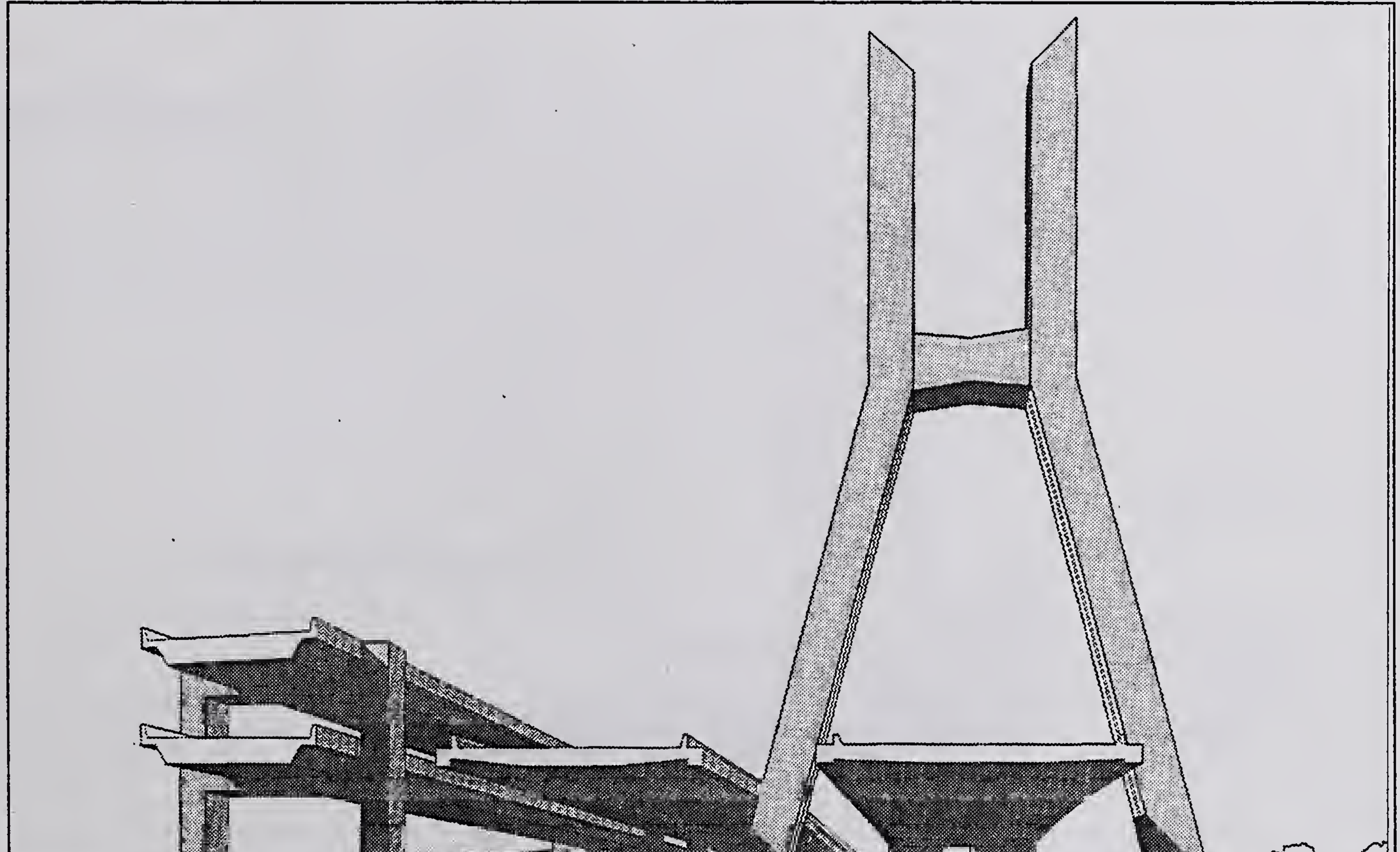
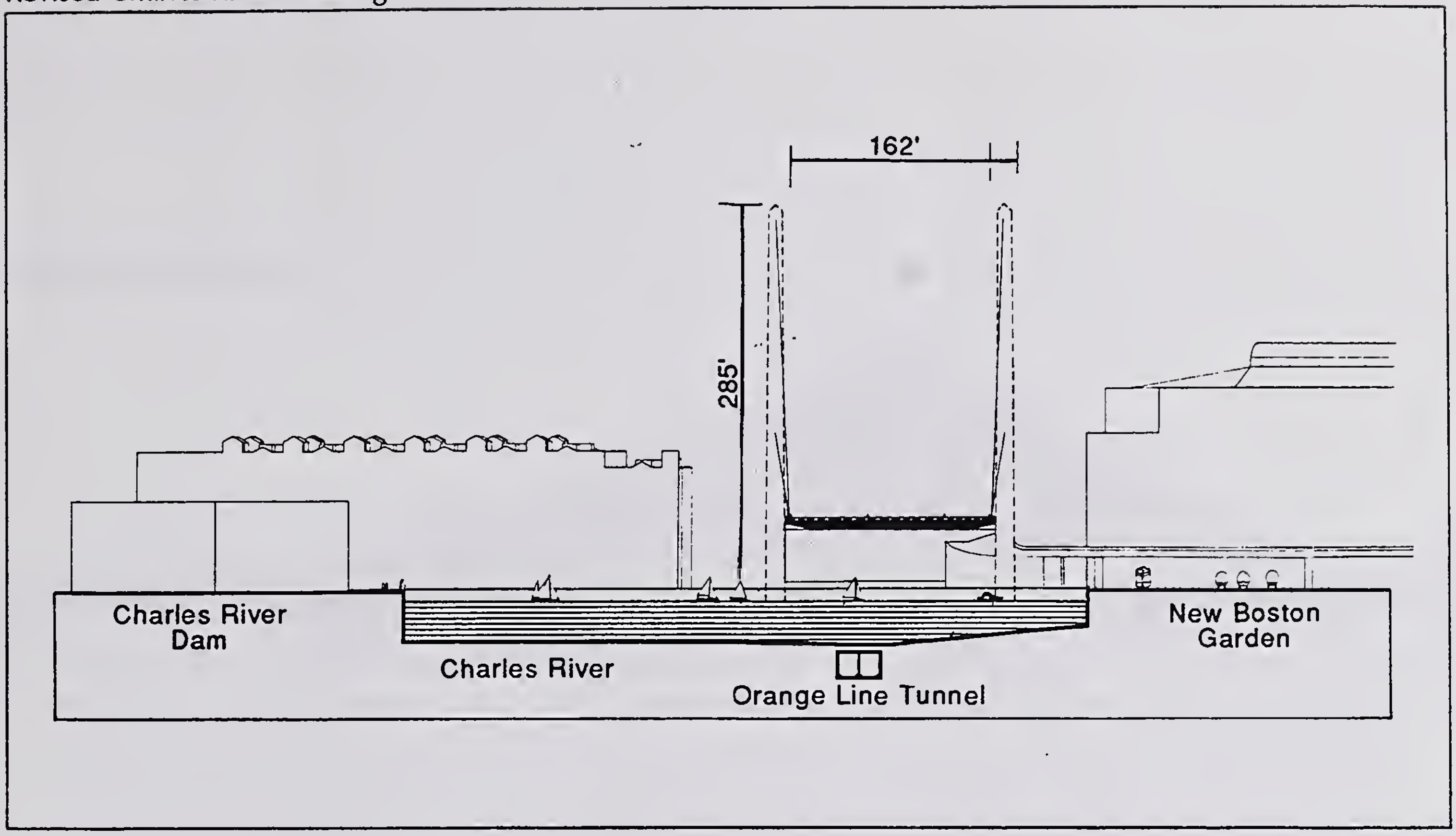


Figure S.7

Sectional View Looking North from South Bank.
Revised Charles River Crossing and FSEIS/R Proposed Action.

Revised Charles River Crossing



FSEIS/R Proposed Action

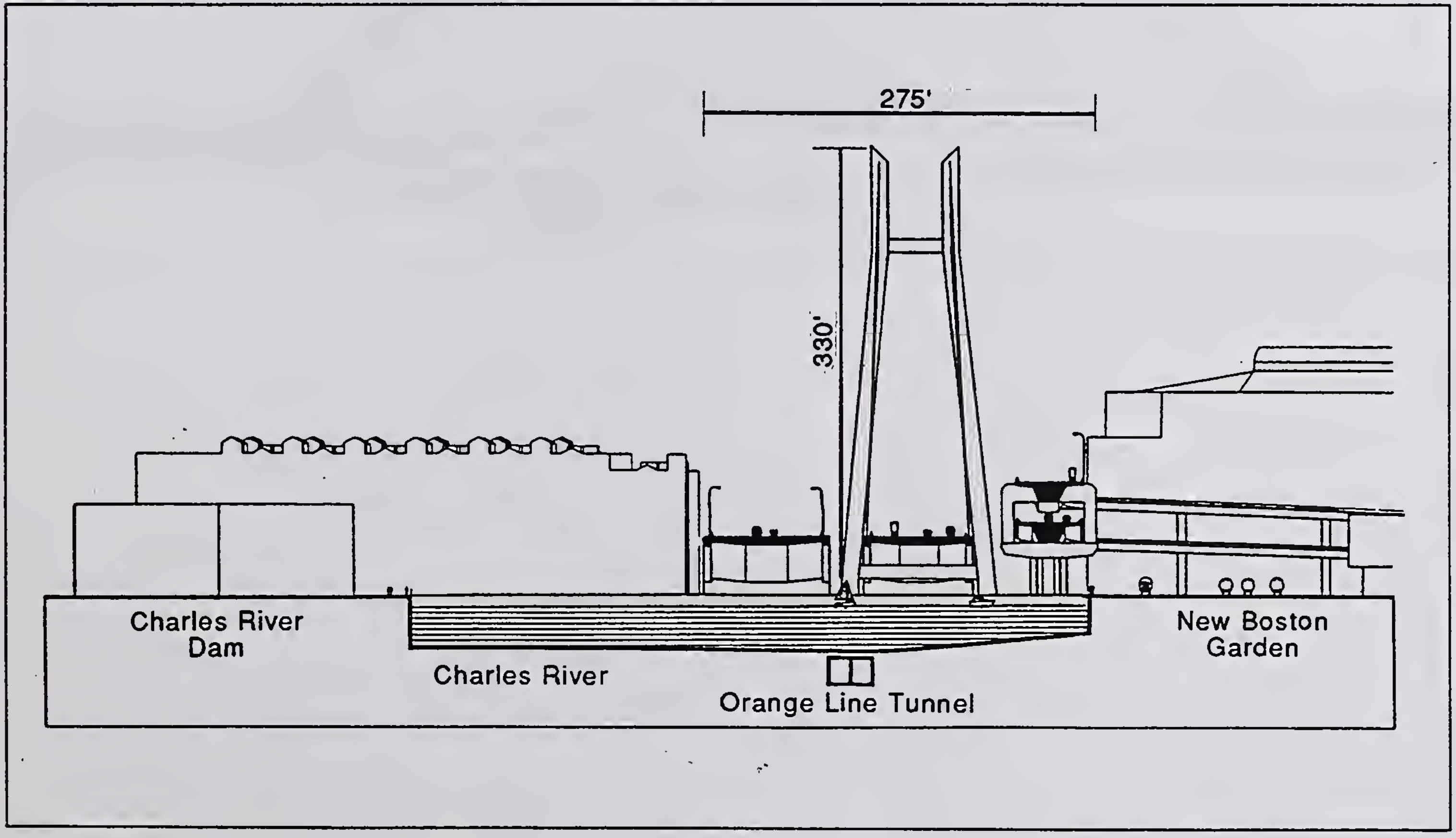
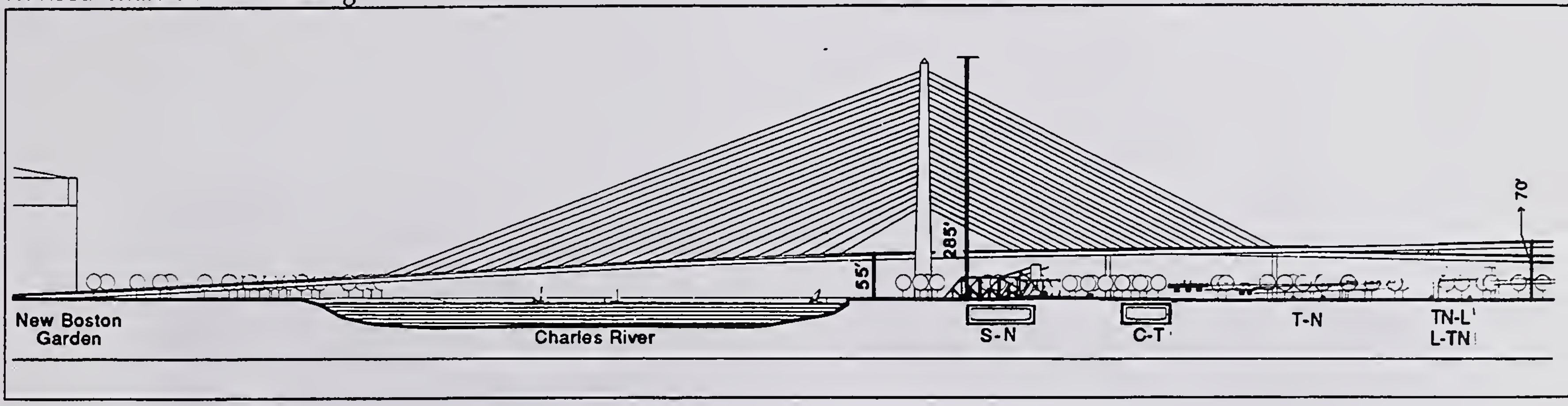


Figure S.8 Section Looking South from Charles River North Bank. Revised Charles River Crossing and FSEIS/R Proposed Action.

Revised Charles River Crossing



FSEIS/R Proposed Action

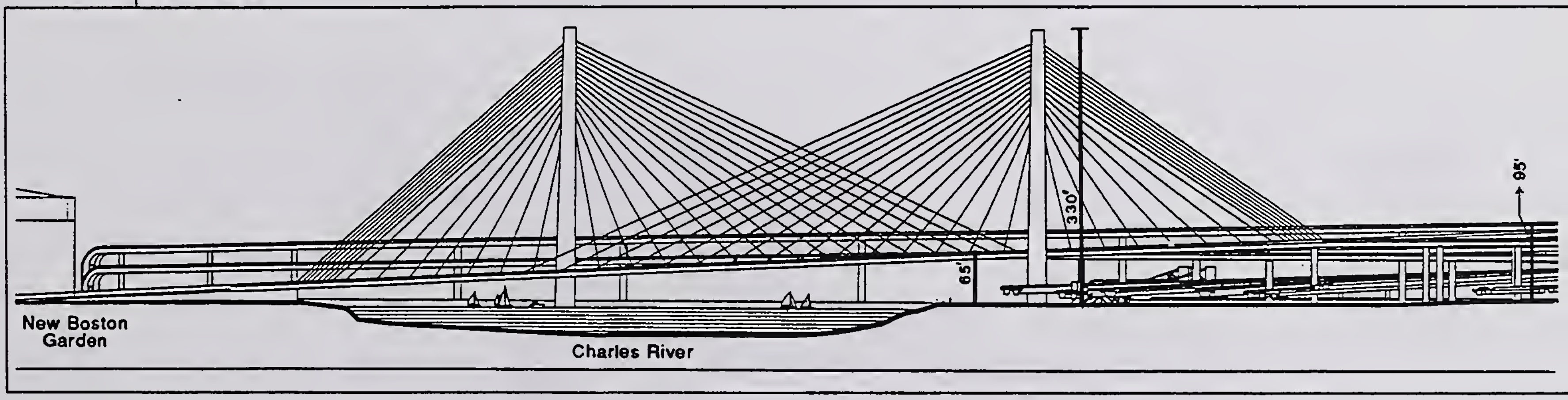
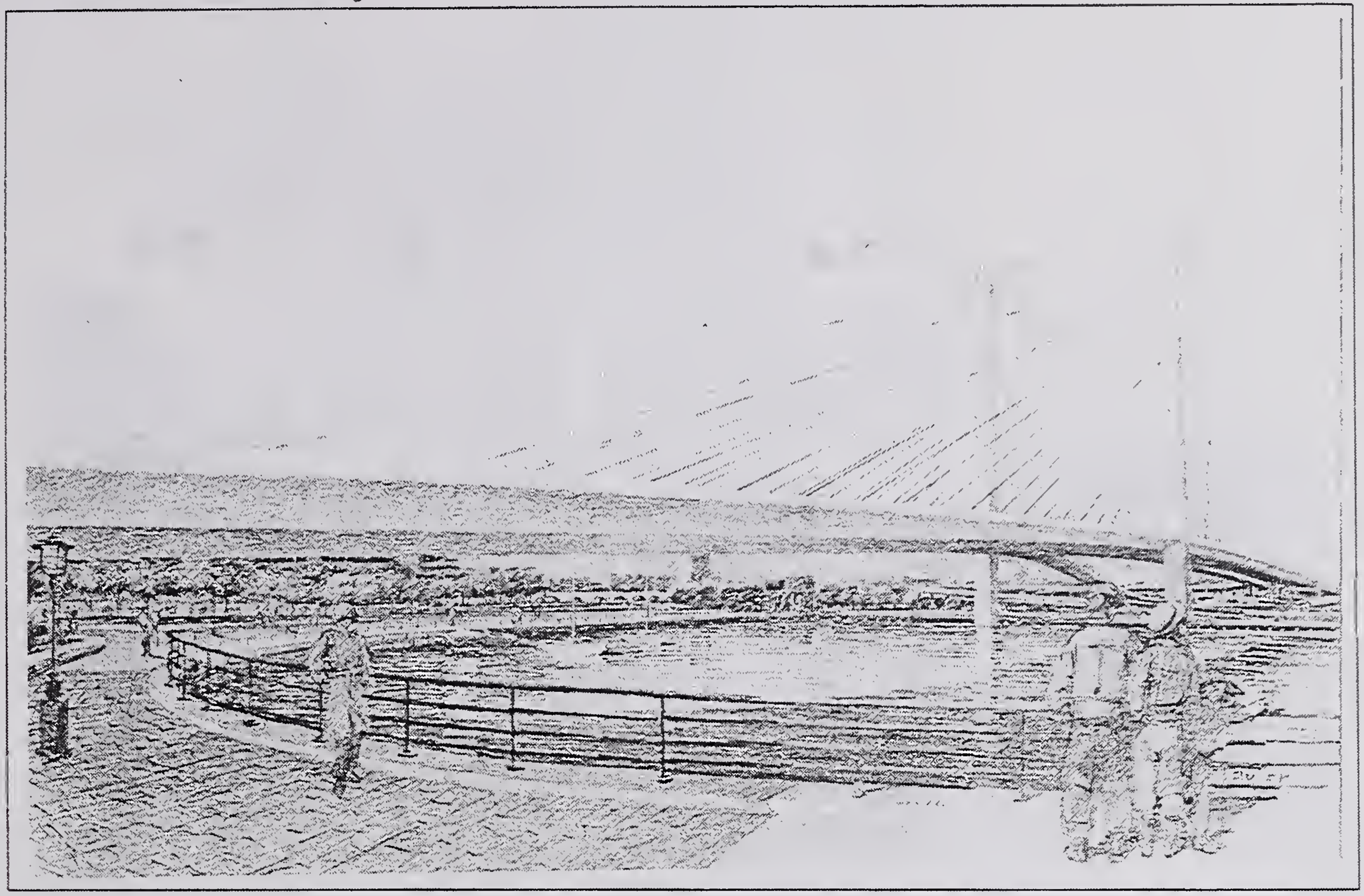


Figure S.9

Elevation Views of Charles River Bridge Looking West.
Revised Charles River Crossing and FSEIS/R Proposed Action.

Revised Charles River Crossing



FSEIS/R Proposed Action

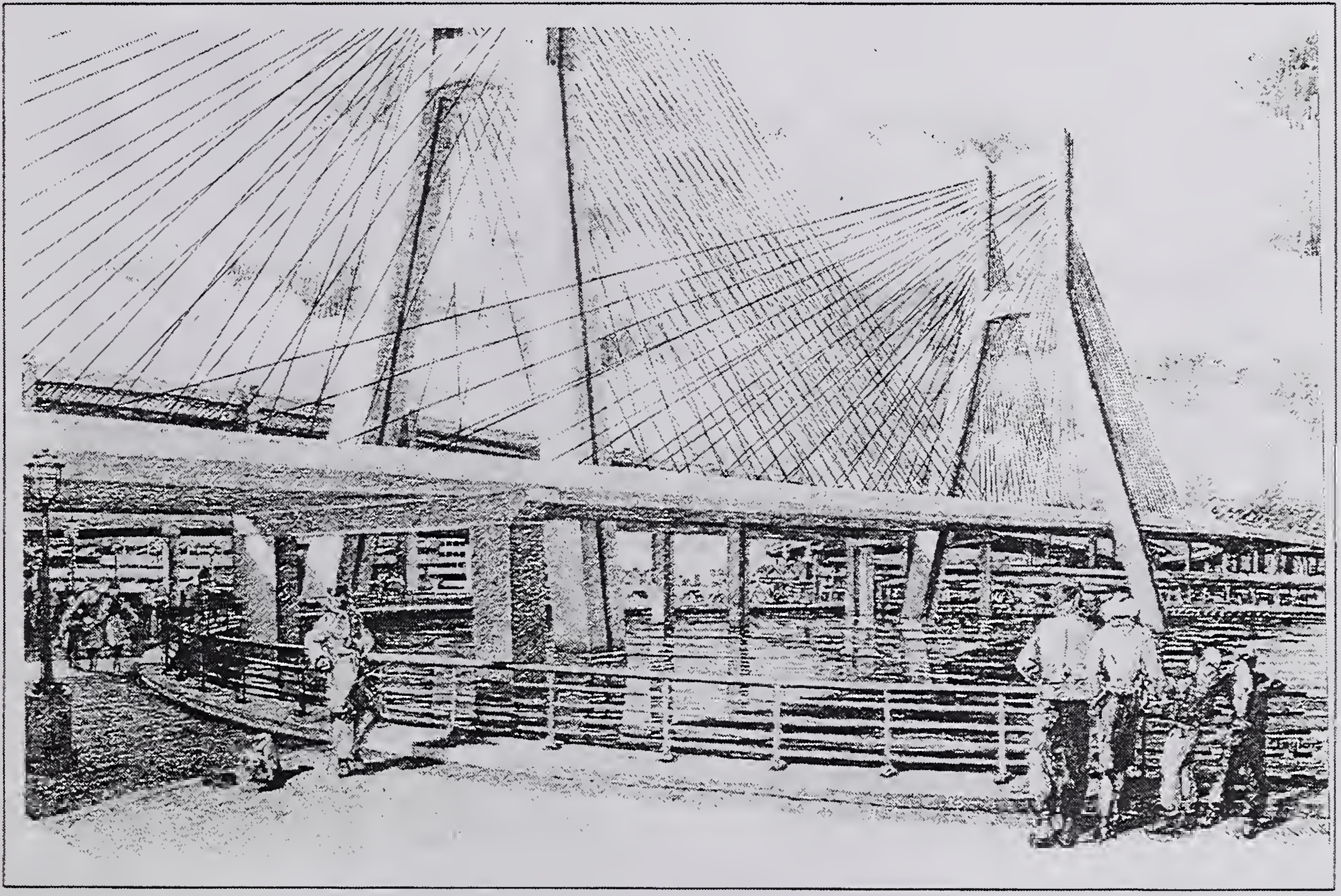
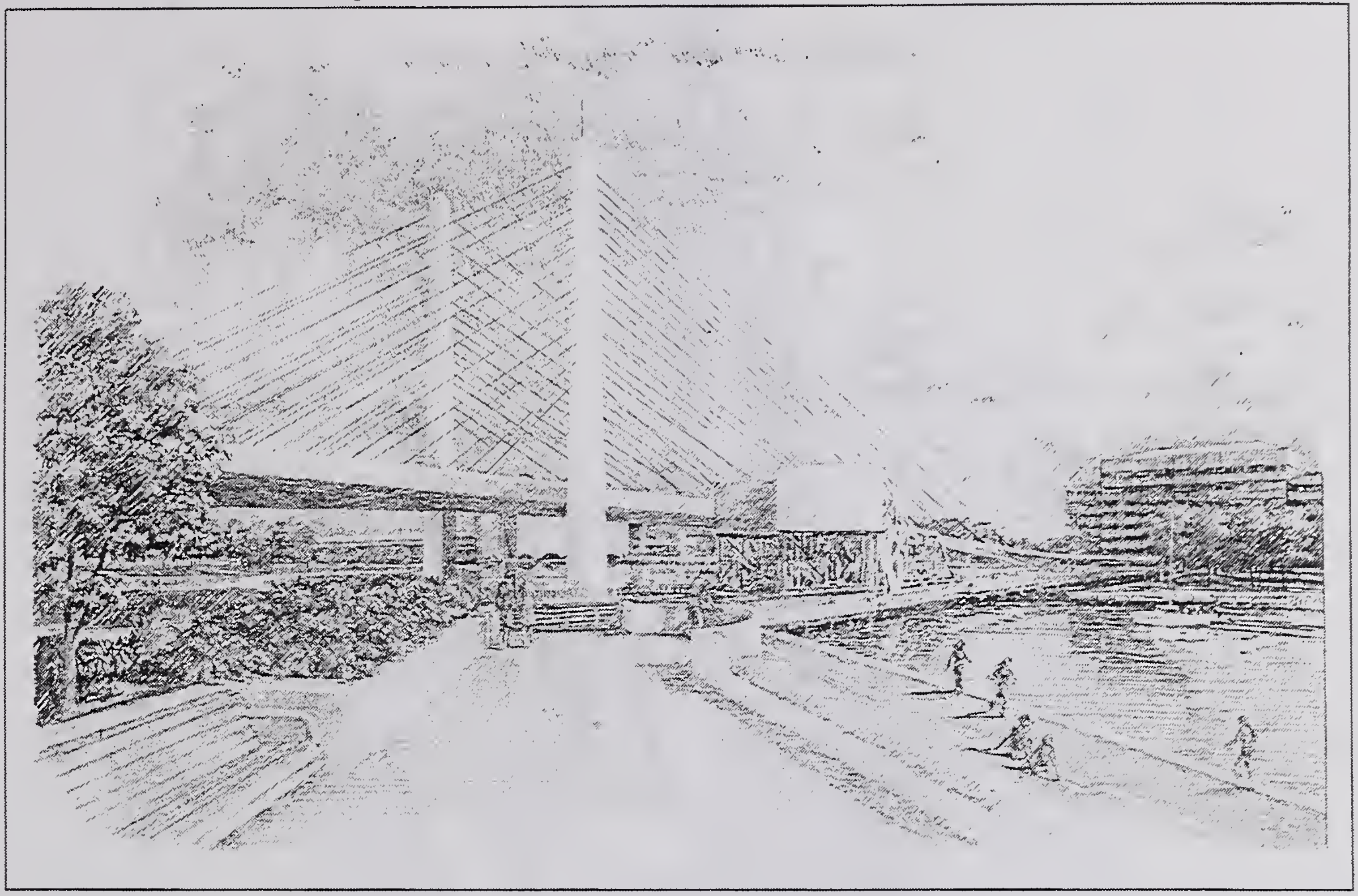


Figure S.10

View of Charles River Bridges from South Bank Looking West. Revised Charles River Crossing and FSEIS/R Proposed Action.

Revised Charles River Crossing



FSEIS/R Proposed Action

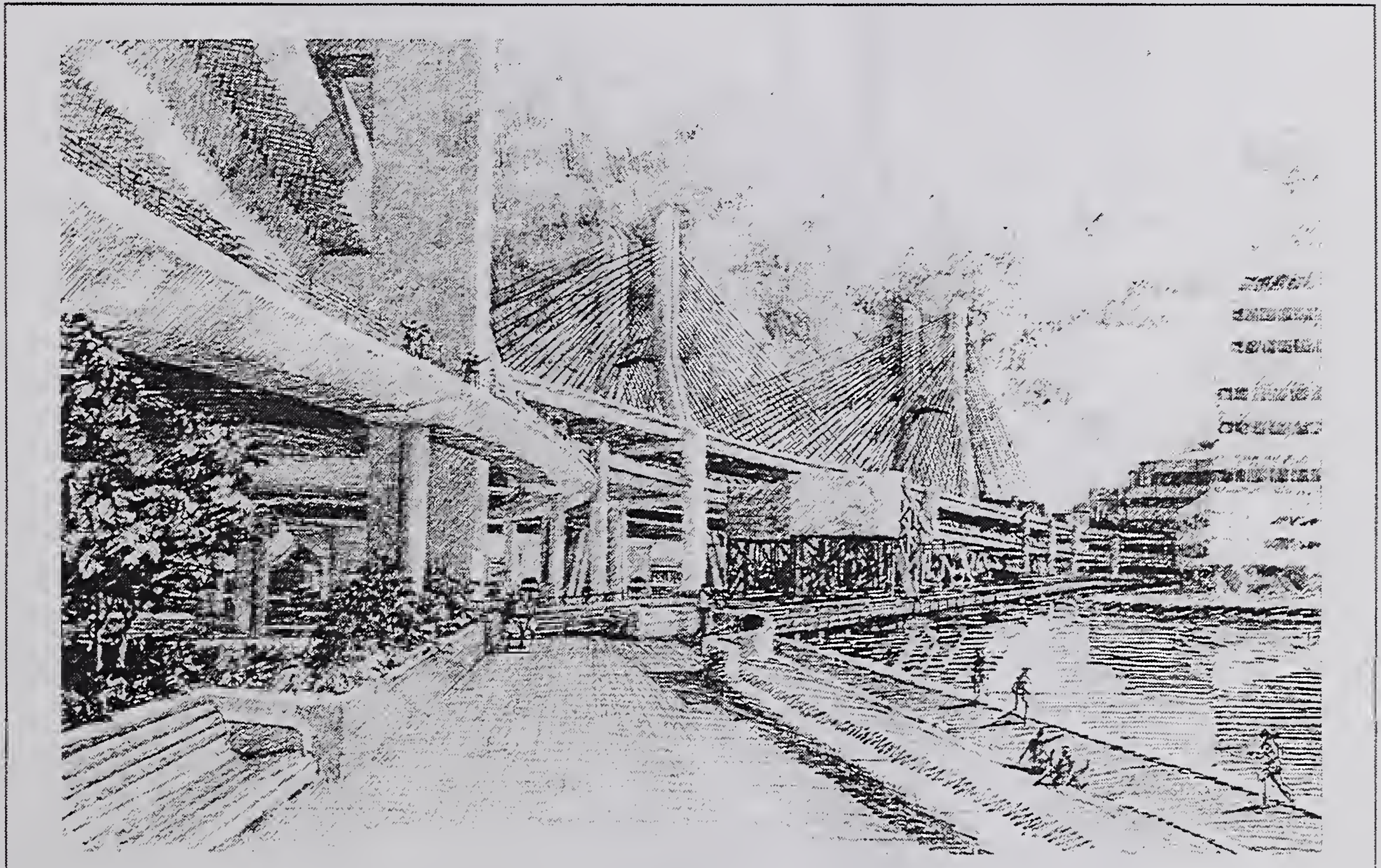


Figure S.11

View of Charles River Bridges from North Bank Looking East. Revised Charles River Crossing and FSEIS/R Proposed Action.

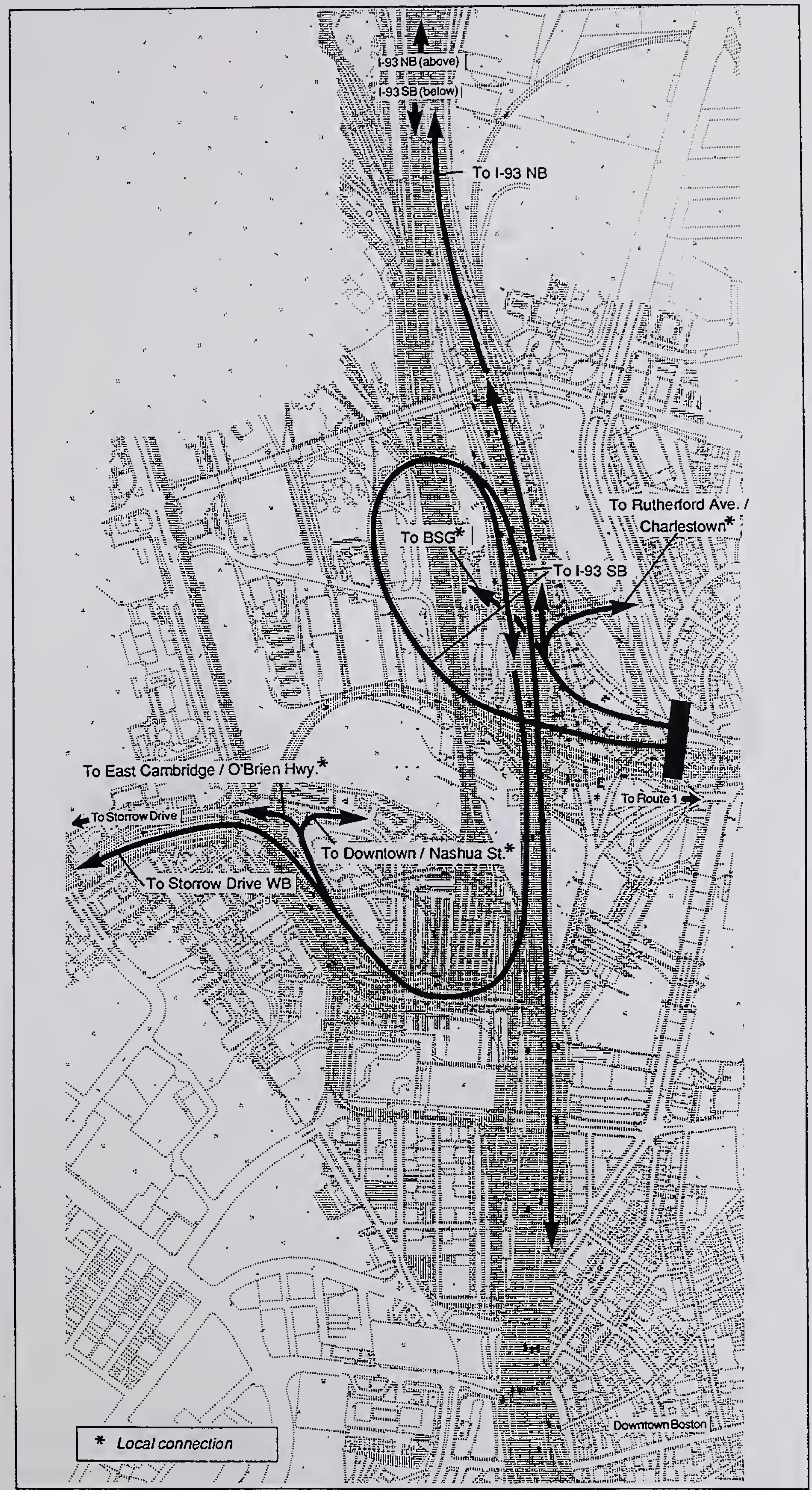


Figure S.12 Traffic Movements from Tobin Bridge (Route 1 SB). Revised Charles River Crossing

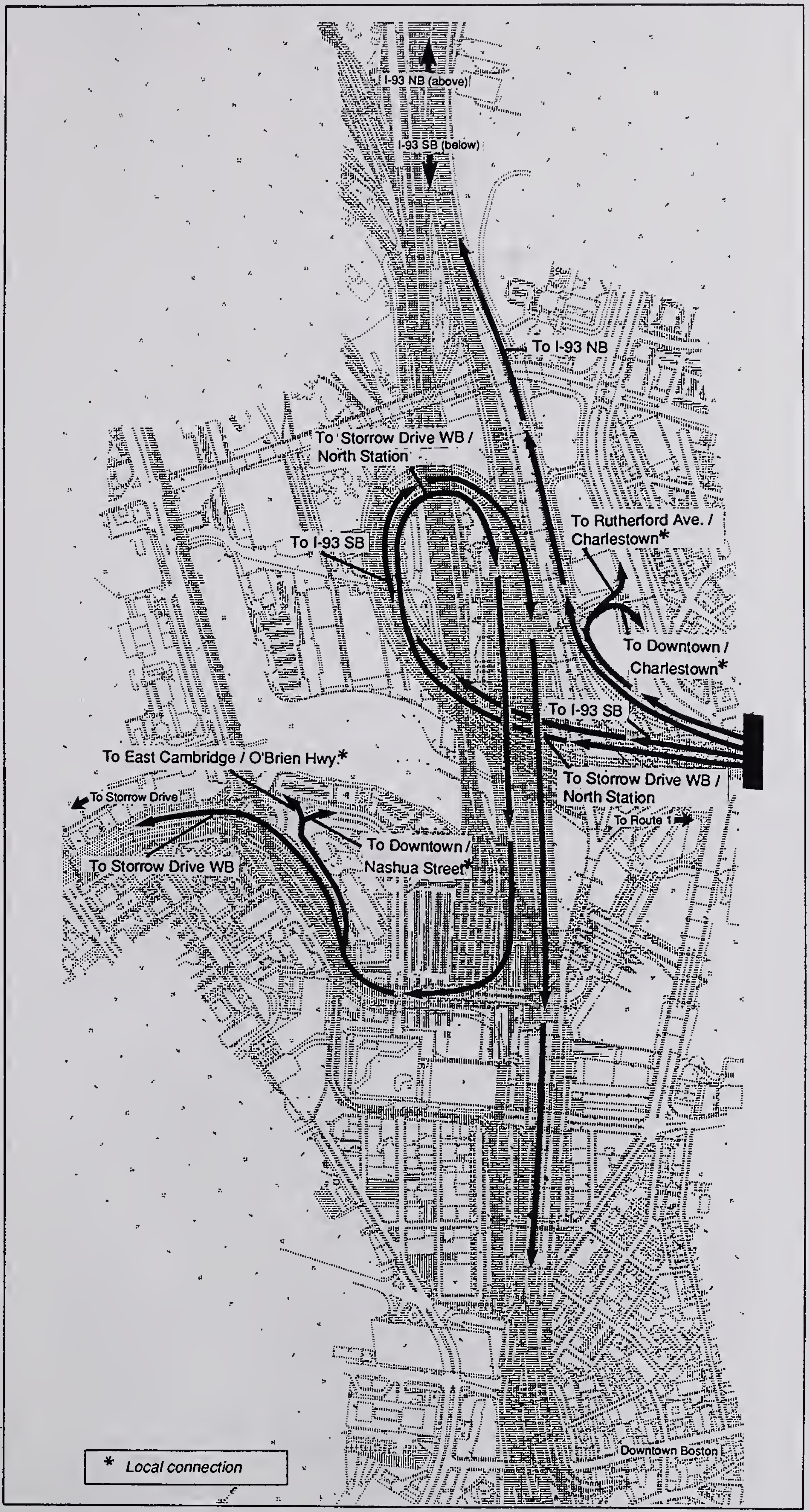

I-93 NB (above)
I-93 SB (below)
To I-93 NB
To Storrow Drive WB / North Station
To Rutherford Ave. / Charlestown*
To I-93 SB
To Downtown / Charlestown*
To I-93 SB
To East Cambridge / O'Brien Hwy*
To Storrow Drive WB / North Station
To Storrow Drive
To Route 1
To Storrow Drive WB
To Downtown / Nashua Street*
Downtown Boston
* Local connection

Figure S.13

Traffic Movements from Tobin Bridge (Route 1 SB). FSEIR/R Proposed Action

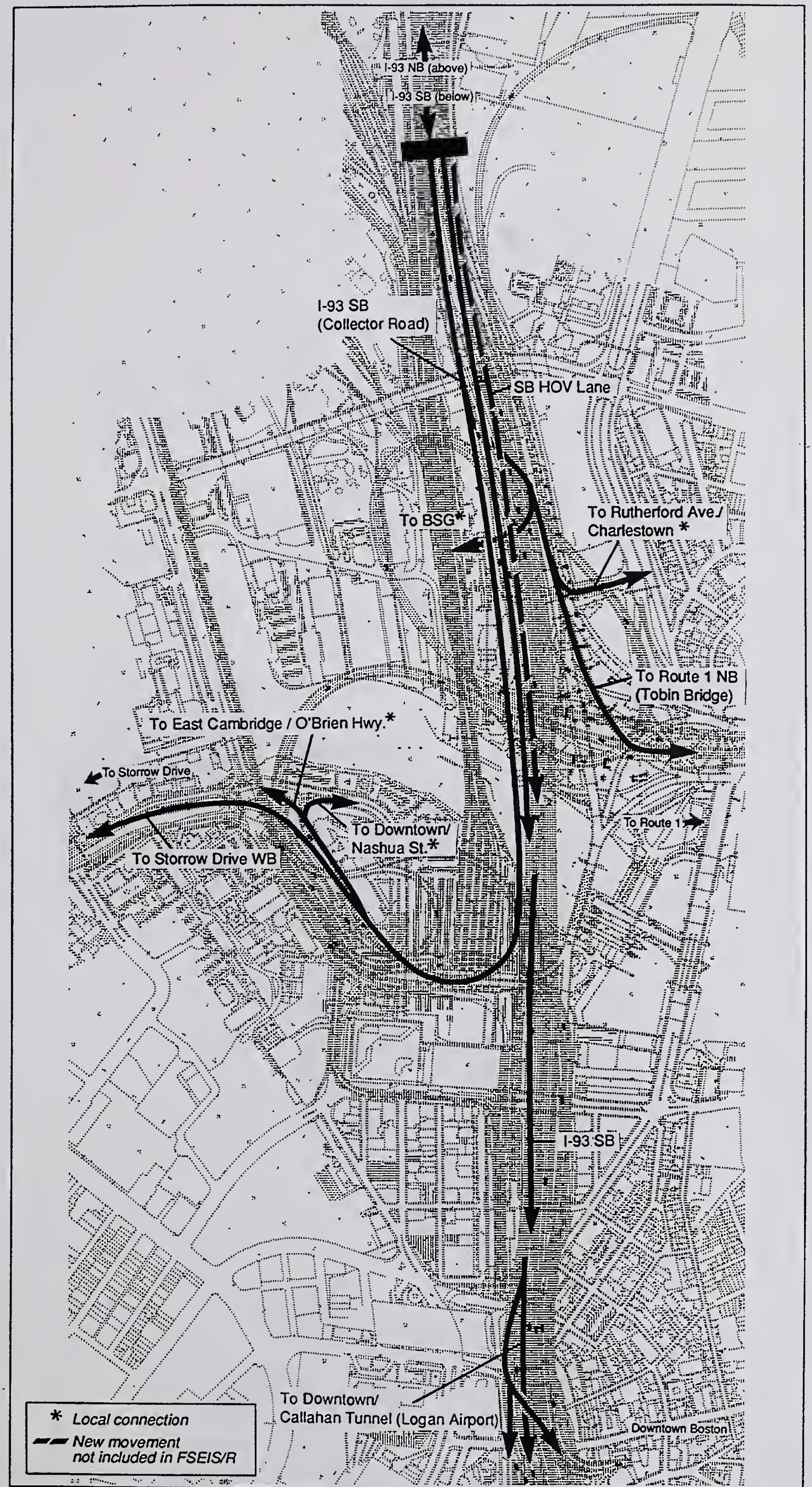


Figure
S.14

Traffic Movements from I-93 SB.
Revised Charles River Crossing.

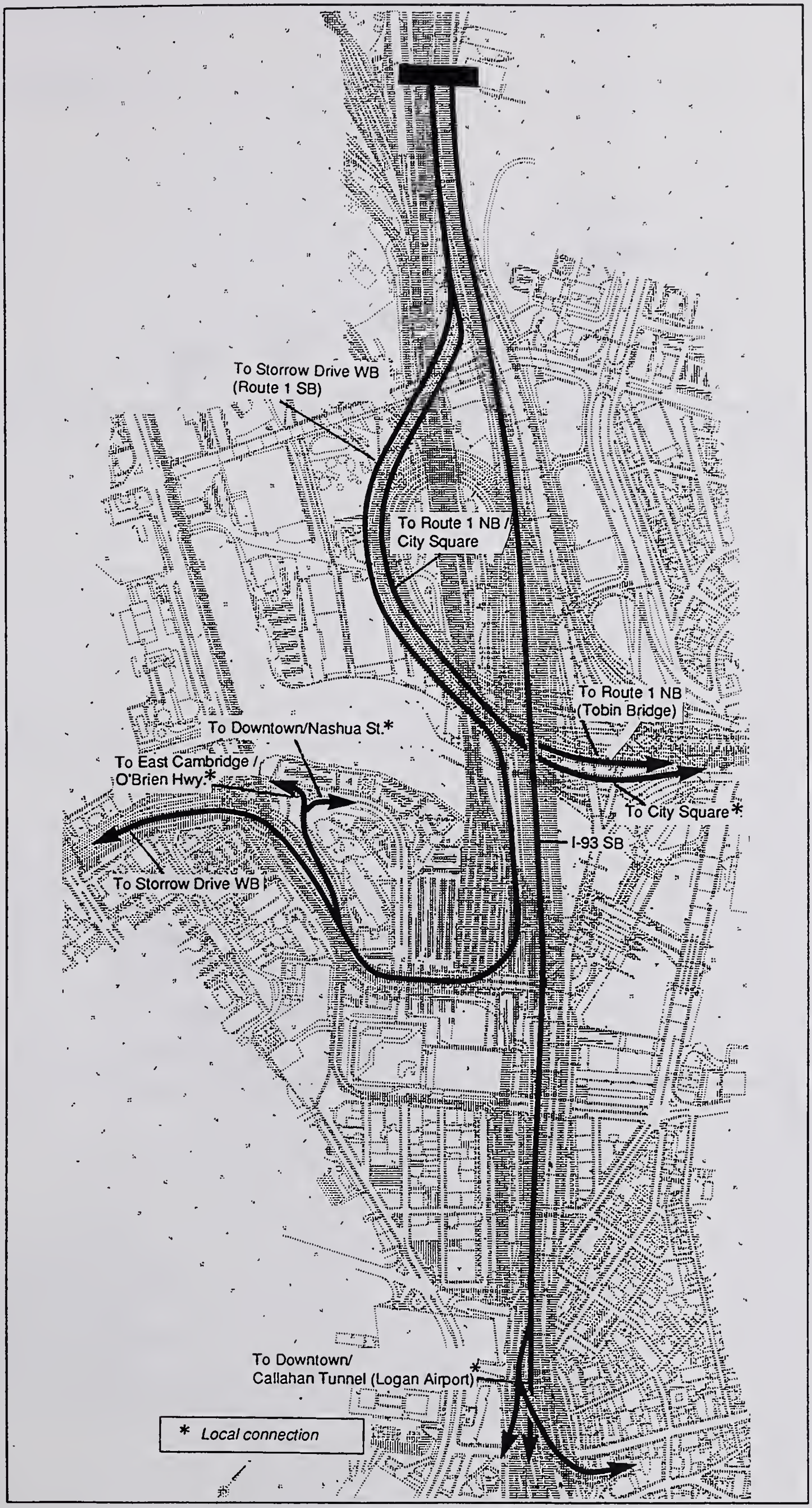
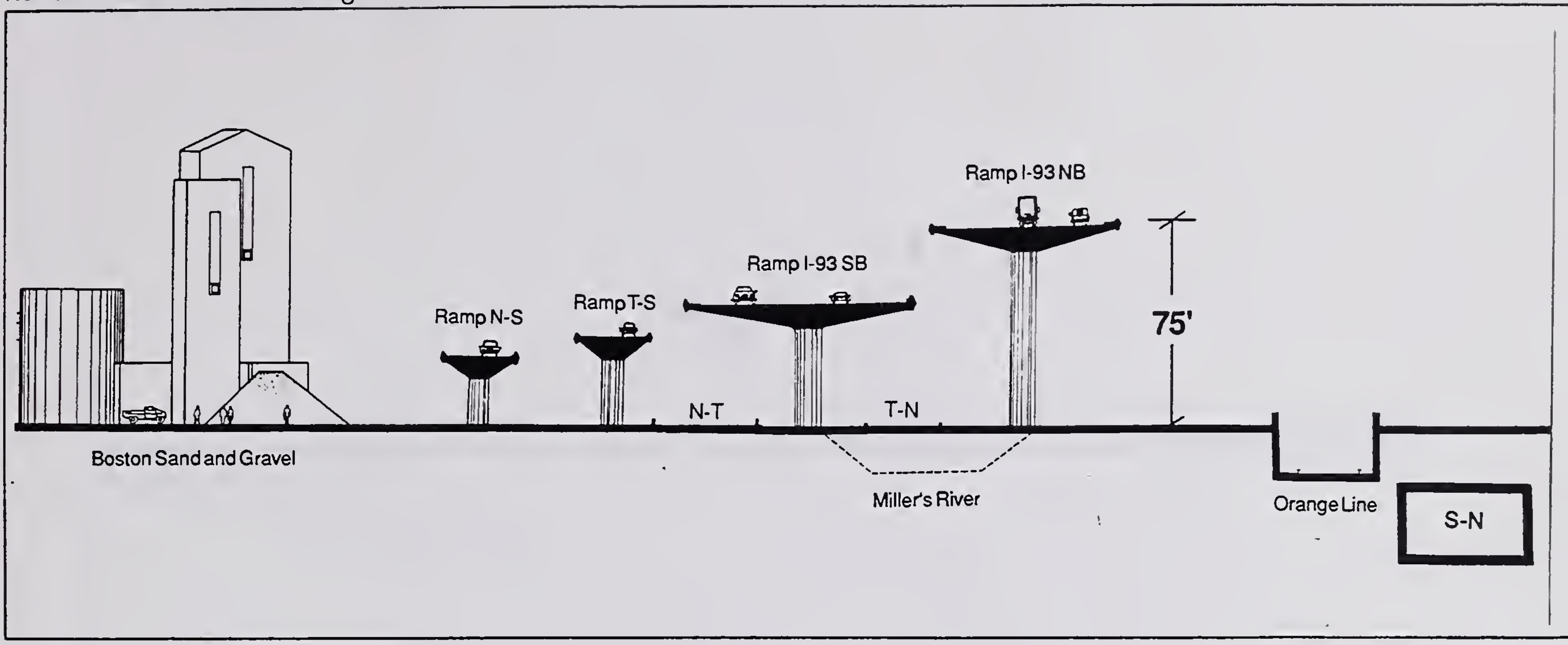


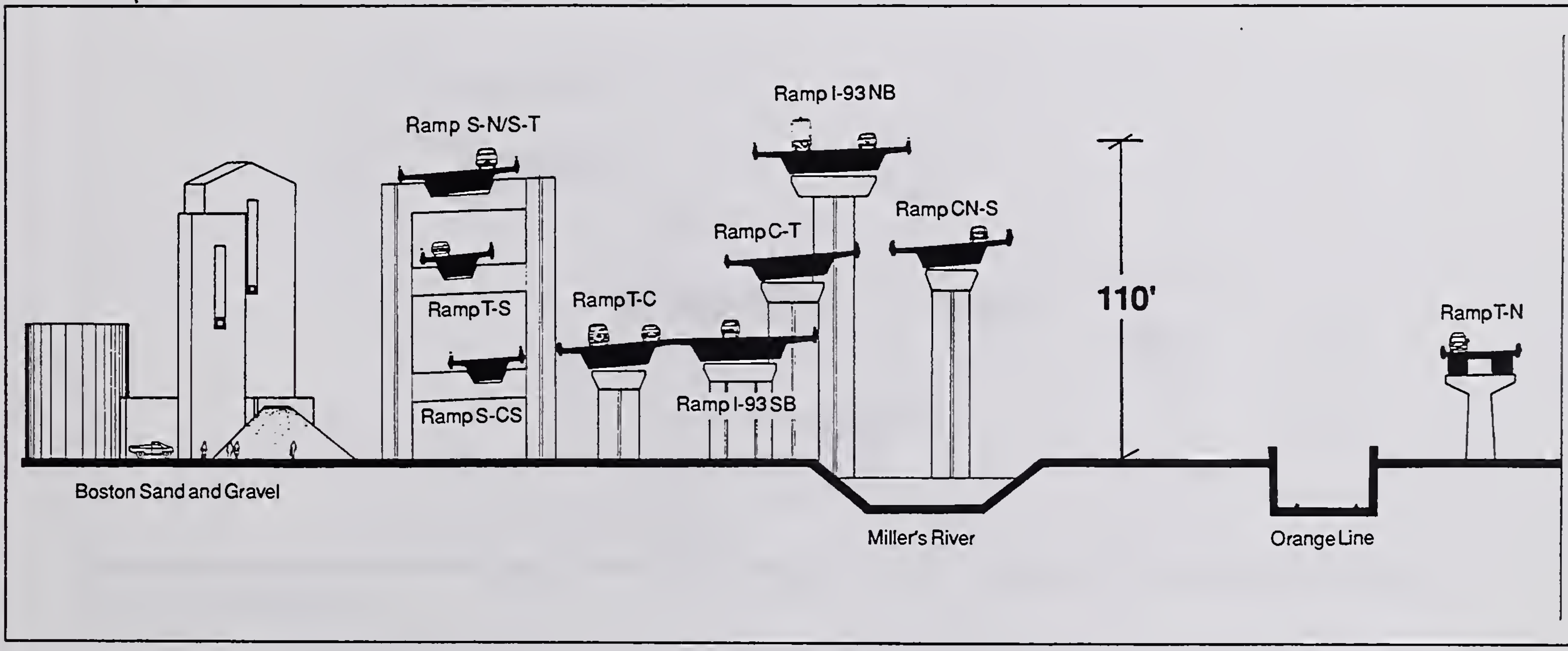
Figure S.15

Traffic Movements from I-93 SB.
FSEIR/R Proposed Action.

Revised Charles River Crossing



FSEIS/R Proposed Action

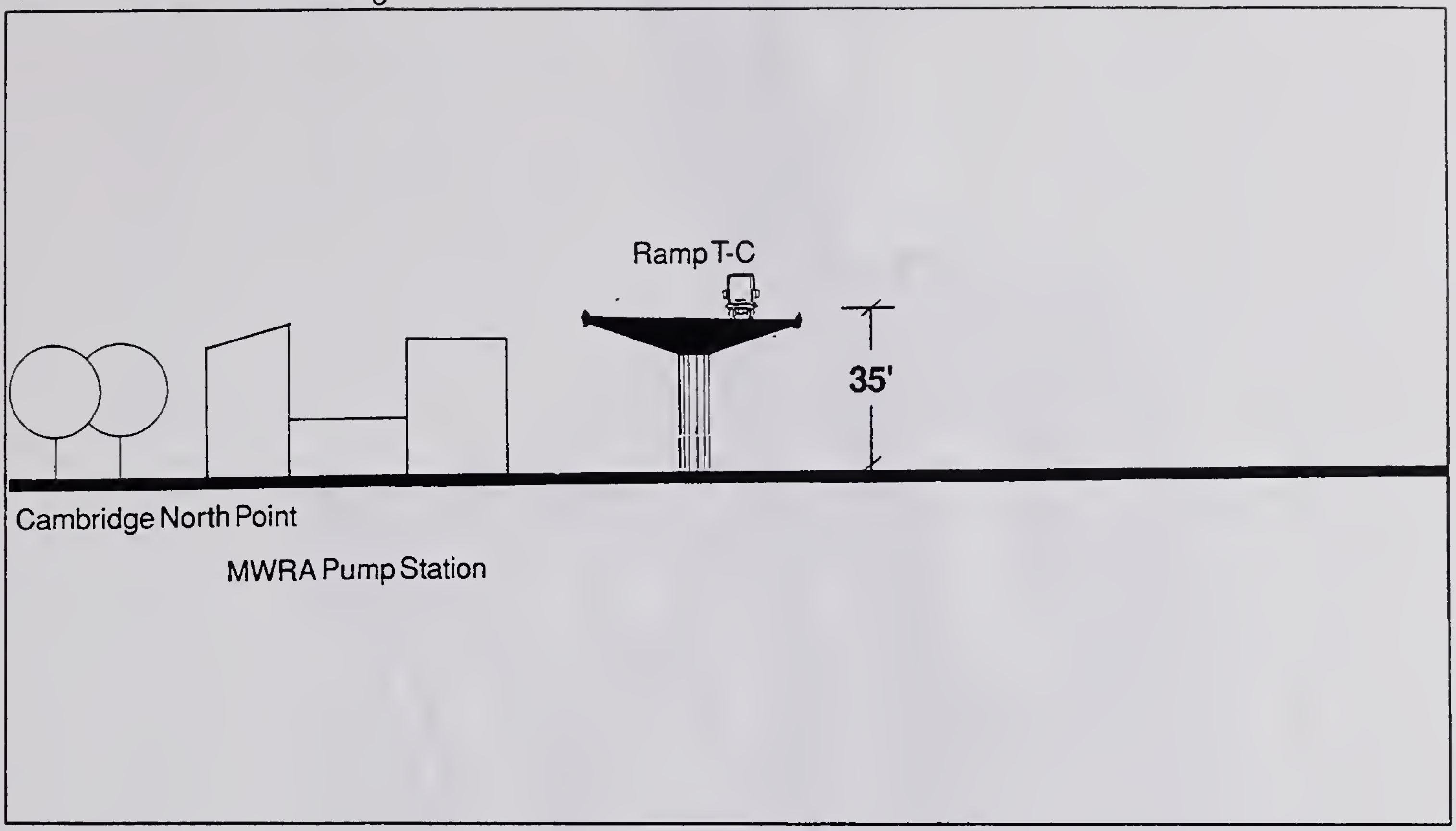


Ramp N-S --- I-93 SB to Storrow Drive WB
Ramp N-T --- I-93 SB to Route 1 NB (Tobin Bridge)
Ramp T-C --- Route 1 SB (Tobin Bridge) to I-93 SB
Ramp S-CS --- Leverett Circle/Strrow Drive to I-93 SB
Ramp CN-S --- I-93 NB to Storrow Drive WB
Ramp C-T --- I-93 NB to Route 1 NB (Tobin Bridge)
Ramp S-N --- Storrow Drive EB to I-93 NB
Ramp S-T --- Storrow Drive EB to Route 1 NB
Ramp T-S --- Route 1 SB (Tobin Bridge) to Storrow Drive WB

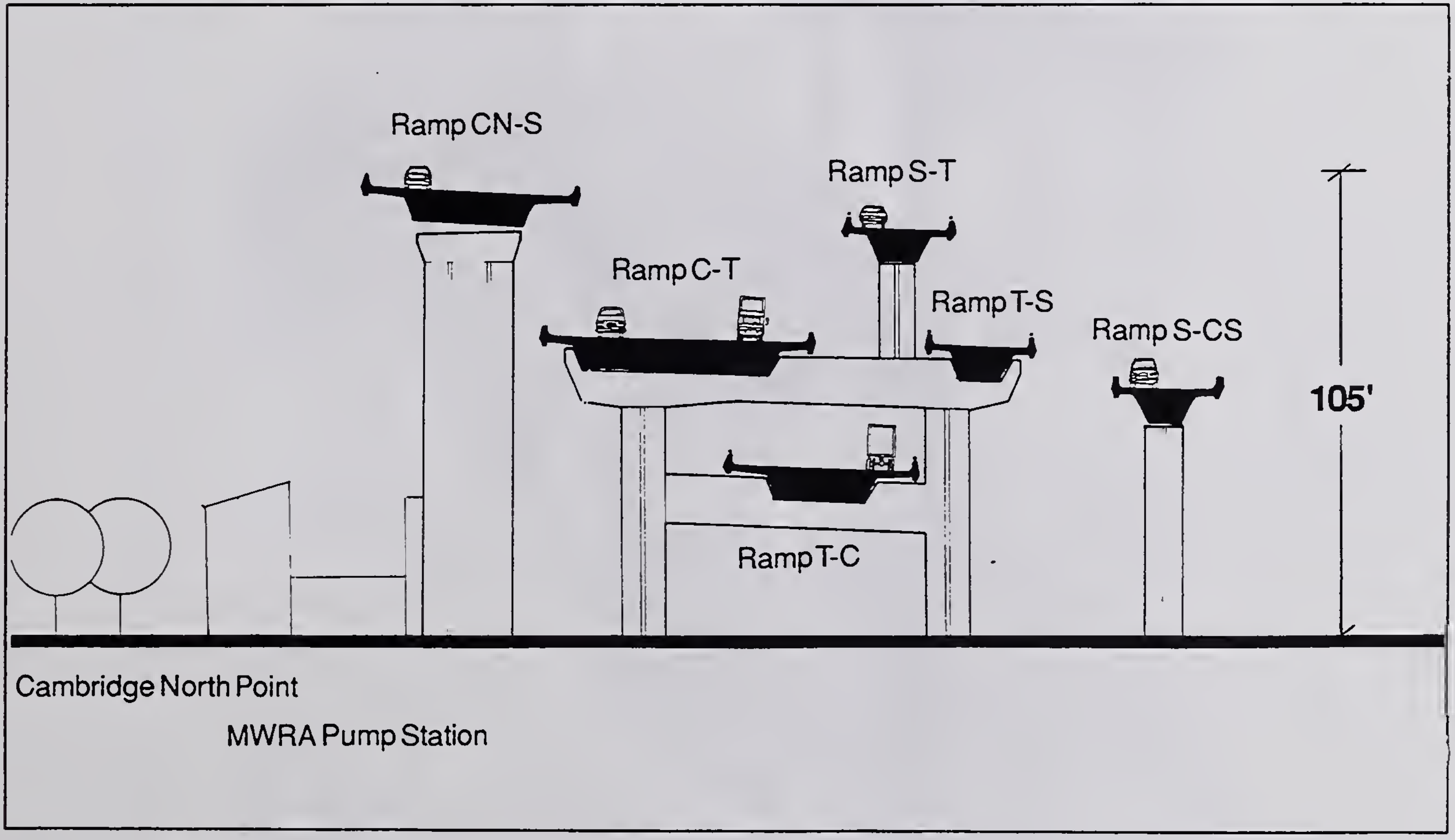
Figure S.16

Section at Loop Ramps.
Revised Charles River Crossing and FSEIS/R Proposed Action.

Revised Charles River Crossing



FSEIS/R Proposed Action



Ramp T-C — Route 1 SB (Tobin Bridge) to I-93 SB
Ramp S-CS — Leverett Circle/Storrow Drive to I-93 SB
Ramp CN-S — I-93 NB to Storrow Drive WB
Ramp C-T — I-93 NB to Route 1 NB (Tobin Bridge)
Ramp S-T — Storrow Drive EB to Route 1 NB
Ramp T-S — Route 1 SB (Tobin Bridge) to Storrow Drive WB

Figure S.17

Section at Loop Ramps.
Revised Charles River Crossing and FSEIS/R Proposed Action.

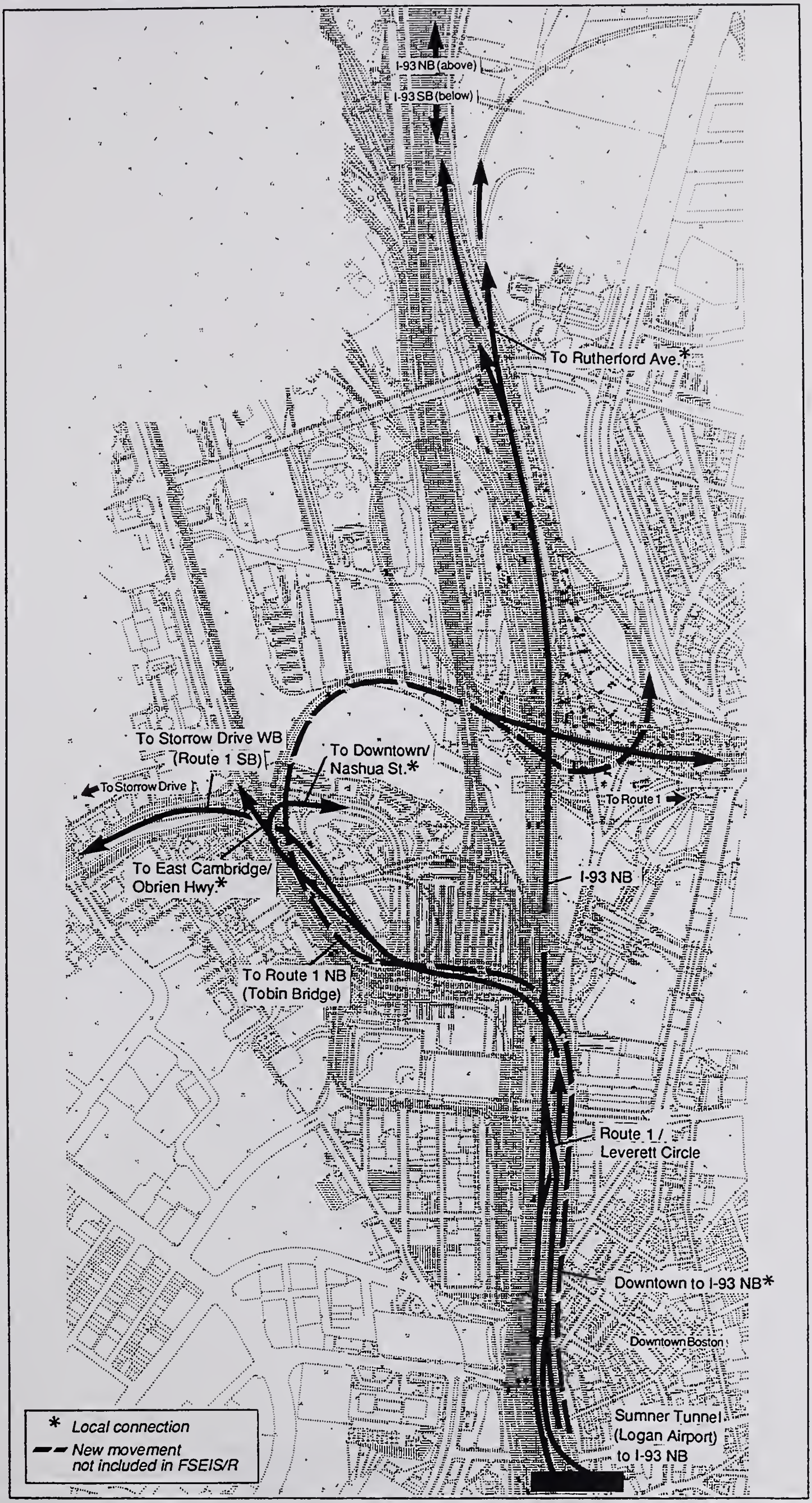


Figure
S.18

Traffic Movements from I-93 NB.
Revised Charles River Crossing.

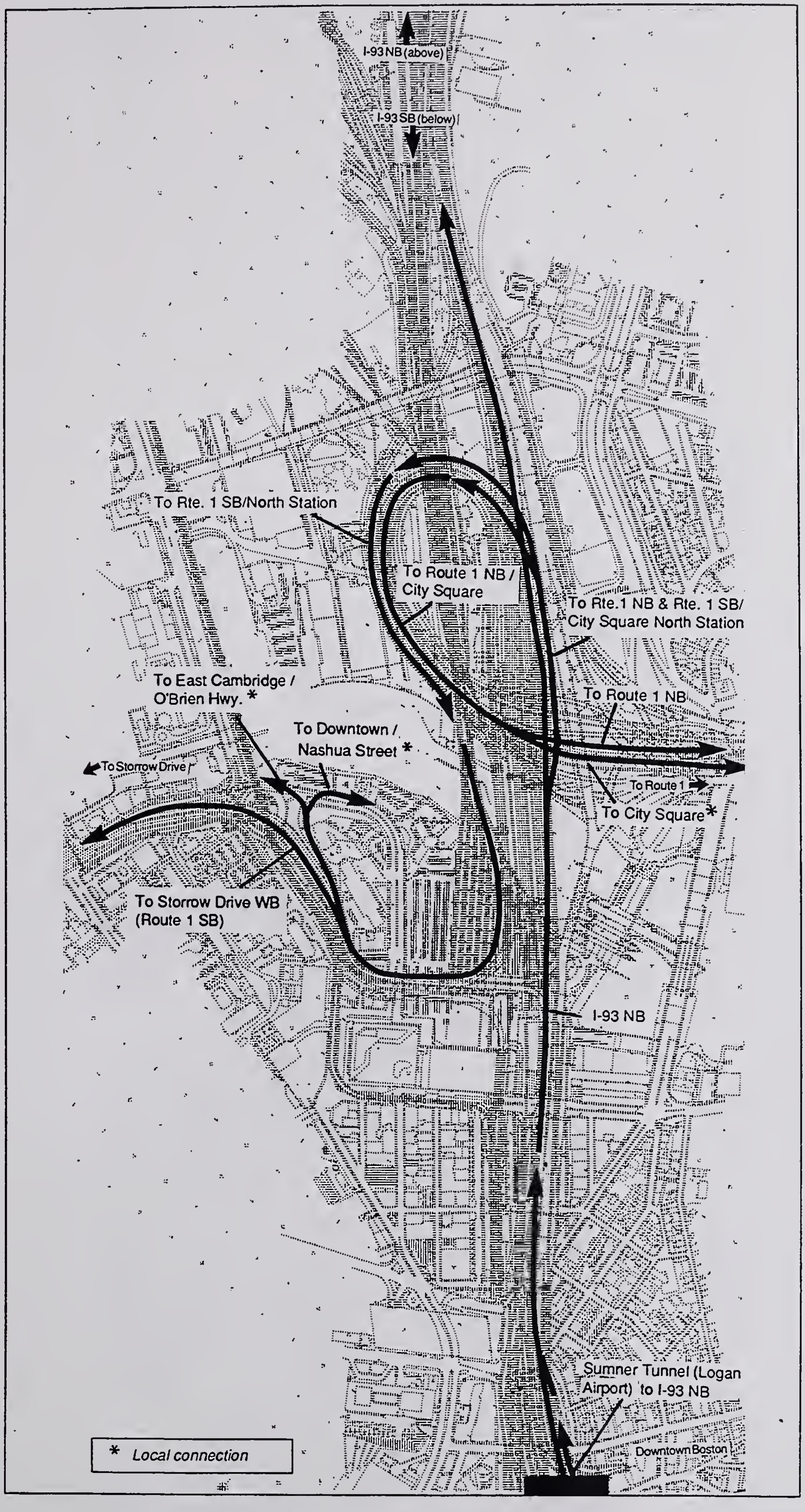

I-93 NB (above)
I-93 SB (below)
To Rte. 1 SB/North Station
To Route 1 NB / City Square
To Rte.1 NB & Rte. 1 SB/ City Square North Station
To East Cambridge / O'Brien Hwy. *
To Downtown / Nashua Street *
To Storrow Drive
To Route 1 NB
To Route 1
To City Square*
To Storrow Drive WB (Route 1 SB)
I-93 NB
Sumner Tunnel (Logan Airport) to I-93 NB
Downtown Boston
* Local connection

Figure S.19

Traffic Movements from I-93 NB.
FSEIR/R Proposed Action.

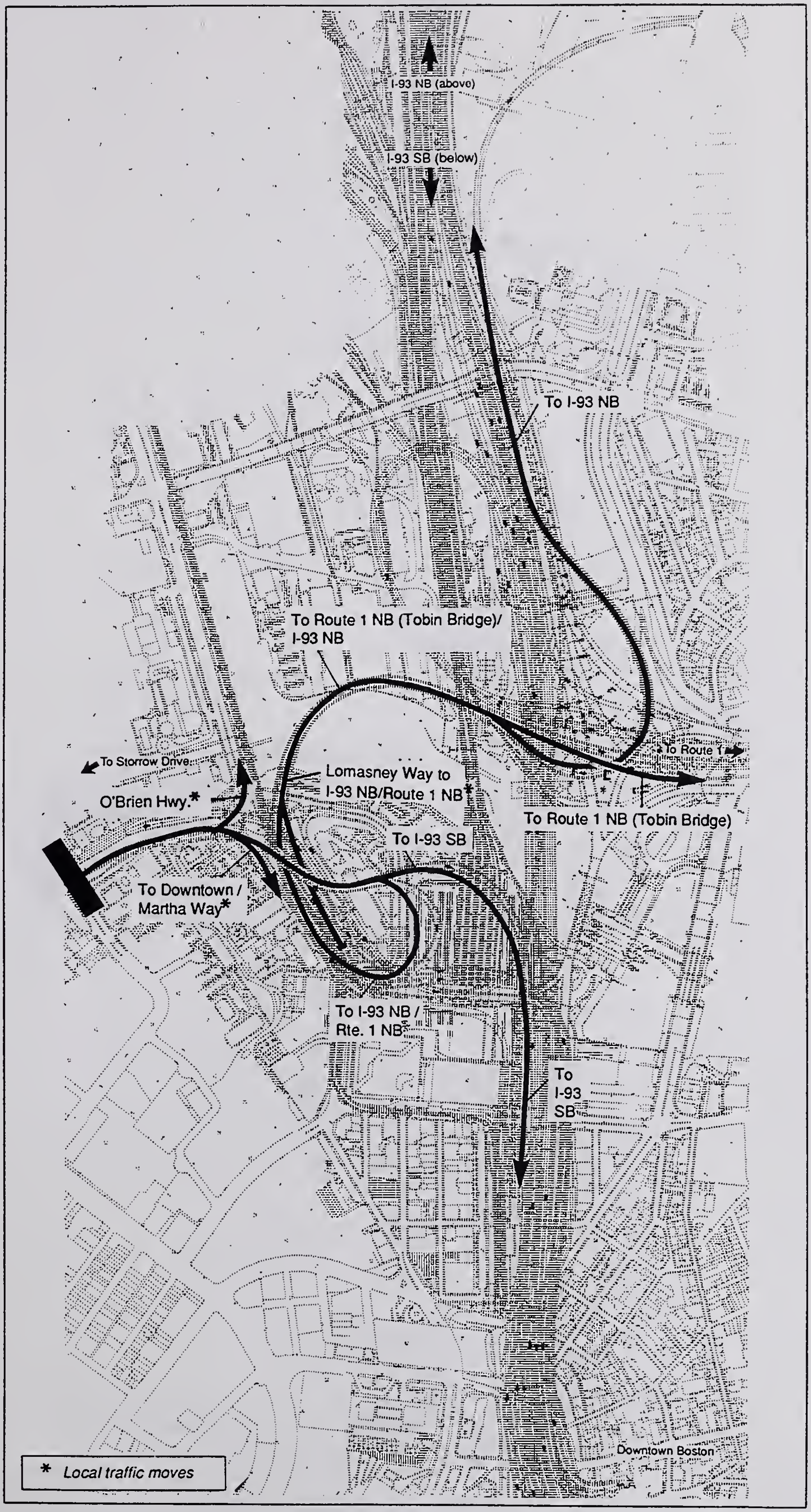


Figure S.20

Traffic Movements from Storrow Drive. Revised Charles River Crossing.

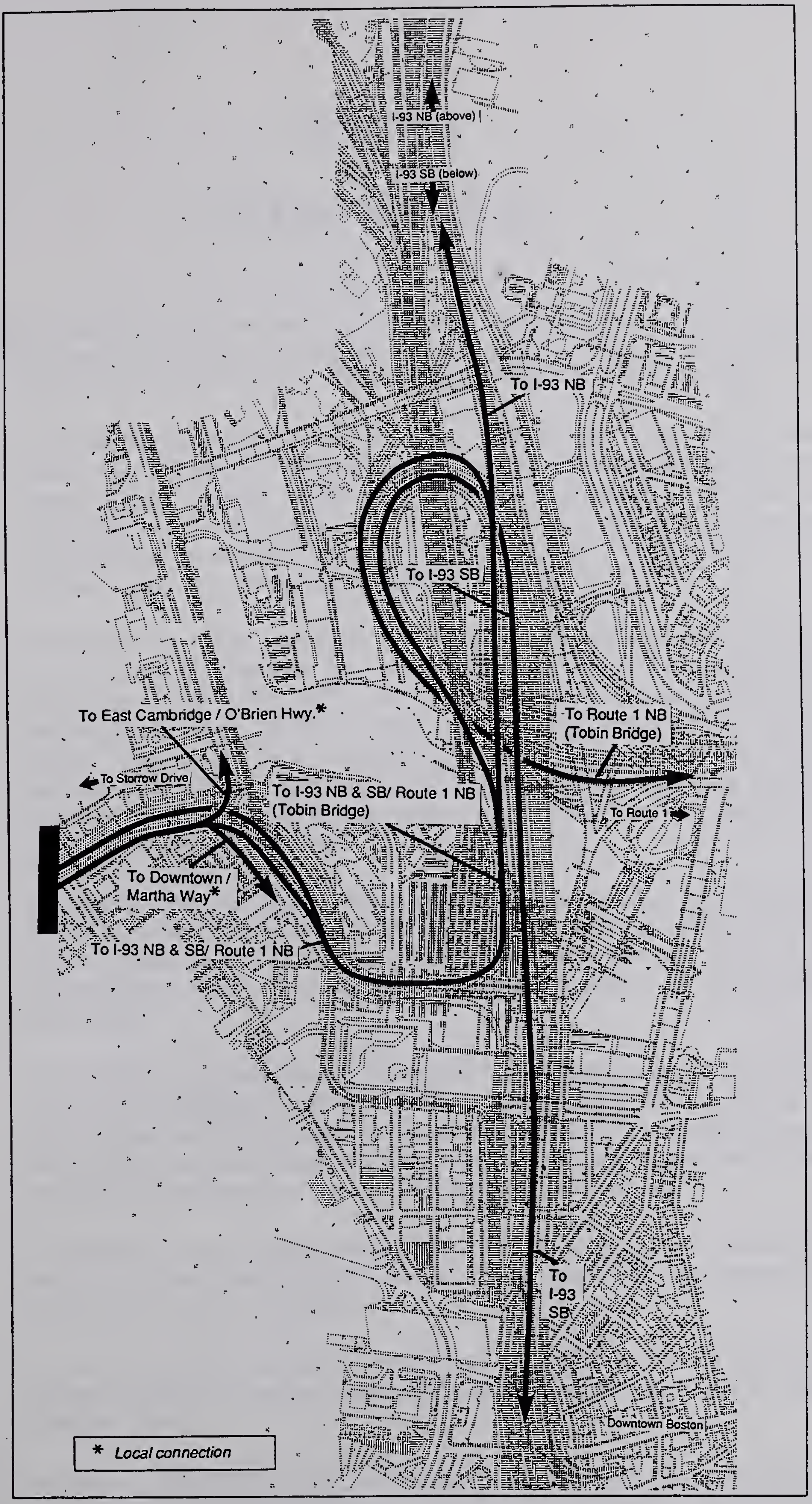

I-93 NB (above)
I-93 SB (below)
To I-93 NB
To I-93 SB
To East Cambridge / O'Brien Hwy.*
To Route 1 NB (Tobin Bridge)
To Storrow Drive
To I-93 NB & SB/ Route 1 NB (Tobin Bridge)
To Route 1
To Downtown / Martha Way*
To I-93 NB & SB/ Route 1 NB
To I-93 SB
Downtown Boston
* Local connection

Figure S.21

Traffic Movements from Storrow Drive.
FSEIR/R Proposed Action.

Chapter 1

INTRODUCTION

The Massachusetts Highway Department submits this Notice of Project Change for the Revised Charles River Crossing in the Area North of Causeway Street subarea (see Figure 1-1) of the Central Artery/Tunnel Project (the project) in Boston. The purposes of this NPC are as follows:

- To fulfill the requirement of the Secretary of Environmental Affairs in the Massachusetts Environmental Policy Act (MEPA) Certificate for the Final Supplemental Environmental Impact Report (FSEIR), January 2, 1991, the Department "continue to review modifications and options to Scheme Z (the Proposed Action) which might reduce the environmental and aesthetic impacts of the Charles River crossing, and to embark on a process to better inform the public about the crossing."

- To address the commitment which the Federal Highway Administration (FHWA) made in its Record of Decision for the FSEIS, May 10, 1991, under the National Environmental Policy Act (NEPA), to remain open throughout the project development process to take advantage of new information that may reduce environmental impacts. FHWA supports the local design review process required by the Secretary of Environmental Affairs which may provide further insight regarding final design of aesthetic bridge structures as well as improvements in the related interchange and regional park development opportunities.

- To document the results of public review which was accomplished through an open mediation process that included intensive citizen volunteer input via the Bridge Design Review Committee (the Committee). The Committee was required by the Secretary of Environmental Affairs and appointed by the Secretary of Transportation and Construction.

- To fulfill additional requirements of the MEPA Certificate on the FSEIR, for Notices of Project Change (NPCs) covering (1) further expansion of the HOV system committed to by the Department in this project, and (2) reincorporation of the Traverse Street on-ramp. Both an HOV lane and a downtown to I-93 northbound on-ramp (at New Sudbury Street) have been incorporated into the Revised Charles River Crossing.

- To describe proposed design changes in the Revised Charles River Crossing portion of the project in the Area North of Causeway Street compared to the approved Proposed Action described in the FSEIS/R.

- To compare potential impacts of the Revised Charles River Crossing with those of the approved FSEIS/R Proposed Action and describe measures to avoid or minimize the potential impacts.

The FSEIS/R provides a useful framework for understanding and addressing the environmental issues which relate to the Revised Charles River Crossing. Details for implementing impact mitigation and avoidance issues, as well as more refined analysis of relevant environmental issues, can appropriately take place during subsequent design and permitting processes, as has been accomplished already in other areas of the project. The Revised Charles River Crossing northern project limit will be extended northerly to Sullivan Square and will include the I-93 southbound HOV lane and the I-93 northbound off-ramp to New Rutherford Avenue past Bunker Hill Community College. The southerly limit of the project subarea will be the same as the FSEIS/R Proposed Action, Causeway Street. The new local I-93 on-ramp at New Sudbury Street will be in the Central Area (the adjacent project subarea to the south). Its effects, however, are described in this NPC. The balance of the Artery/Tunnel Project area will be unaffected by this proposed design change. Information in this NPC is built upon analyses and findings available in the FSEIS/R. The NPC does not duplicate analyses related to the unchanged portions of the project. Issues subject to further evaluation in the permit and design process are identified at the end of the NPC.

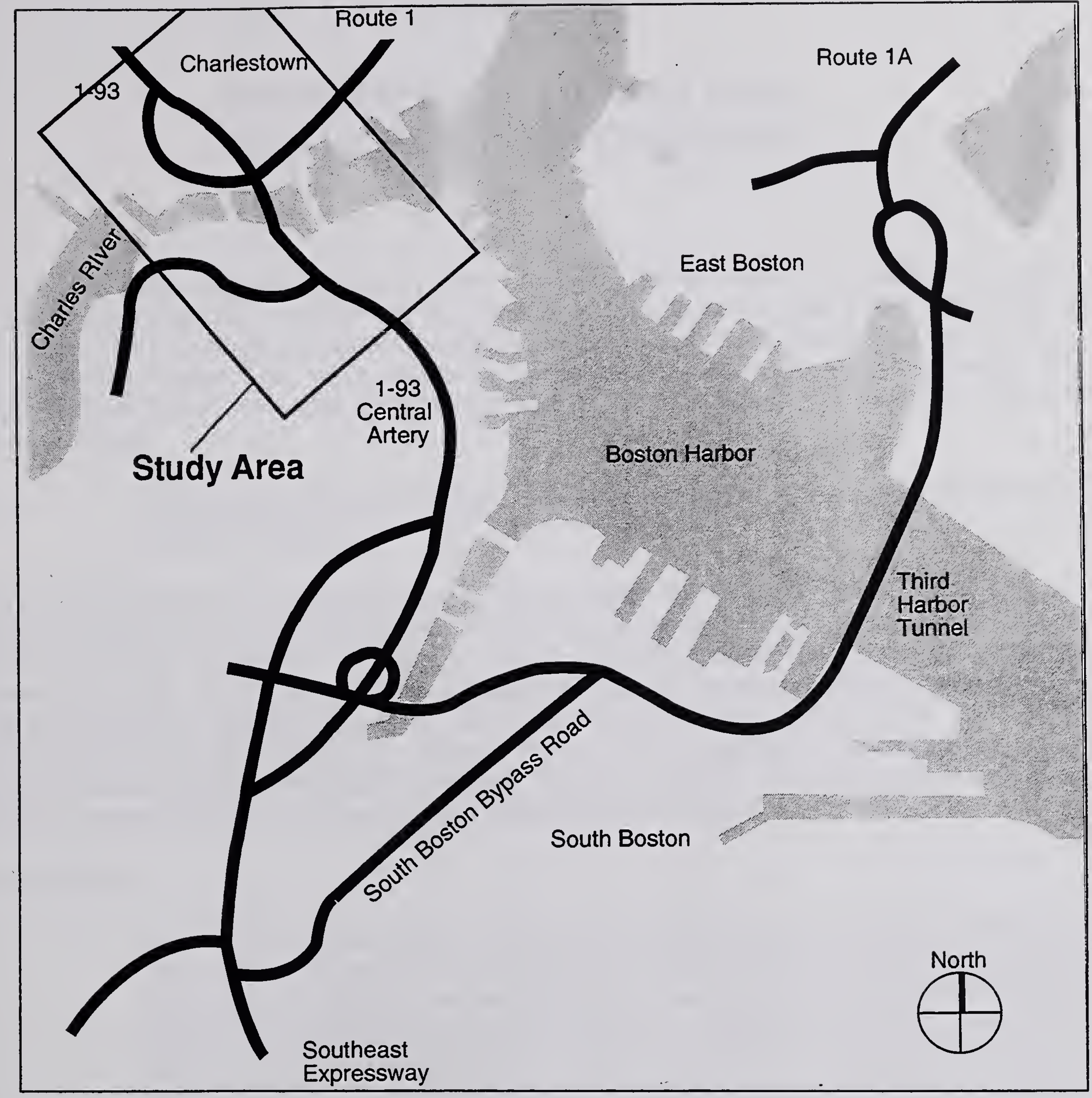


Figure 1.1

Project Location.
Area North of Causeway Street.

Chapter 2

DESCRIPTION OF REVISED CHARLES RIVER CROSSING

The proposed design changes in the Area North of Causeway Street, referred to as the Revised Charles River Crossing in this NPC, are described below and compared with the Proposed Action in the FSEIS/R for the project. In addition, the intensive public evaluation process that has taken place since approval of the FSEIS/R in early 1991, which resulted in the recommended design changes, is reviewed. The chapter ends with a list of benefits of the Revised Charles River Crossing compared with the FSEIS/R Proposed Action.

2.1 Description Of Revised Charles River Crossing And Comparison To FSEIS/R Proposed Action

The Revised Charles River Crossing in the Area North of Causeway Street is different from the Proposed Action in the FSEIS/R (Scheme Z Modified), although it includes elements of a variant described in the FSEIS/R (Scheme T Modified). The design is based on the recommendations of the Bridge Design Review Committee, the Executive Office of Transportation and Construction (EOTC), Massachusetts Highway Department (the Department), the City of Boston, and the City of Cambridge. The Revised Charles River Crossing is based on a conceptual design which will be further developed and refined through subsequent environmental permit processes. The Revised Charles River Crossing consists of the following changed elements, compared to the FSEIS/R Proposed Action.

I-93 Mainlines.

- In the Revised Charles River Crossing, the Interstate 93 (I-93) mainline highway will cross over the Charles River on a single bridge comprising four lanes each in northbound and southbound directions and an additional two lanes on the western side of the mainline bridge to carry I-93/Route 1 southbound traffic to Leverett Circle/Storrow Drive, for a total of 10 lanes over the river. By comparison, the FSEIS/R Proposed Action has two mainline bridges containing five lanes in each direction plus one six-lane (three over three) double-decked structure to accommodate all traffic movements to Leverett Circle/Storrow Drive for a total of 16 lanes over the river. As a result of this change, the Revised Charles River Crossing bridge will be reduced to a width of approximately 162 feet, which is 113 feet narrower than the three bridges in the FSEIS/R Proposed Action. The Revised Charles River Crossing will remove the double-crossings on the I-93 mainline improving operational efficiency and reducing vehicle miles of travel (VMT). This design change is shown in Figures S.5 through S.7.

Bridge Structure Type.

- The Revised Charles River Crossing bridge will be a cable-stayed structure with a single twin-legged tower approximately 285 feet in height located along the north side of the Charles River. The FSEIS/R Proposed Action includes two cable-stayed bridges with towers on both sides of the river each approximately 330 feet in height, plus a double-decked bridge that varies in type and profile with the mainline bridge. The design change will improve the visual aesthetics of the Charles River Basin and parkland along the north and south banks of the river by simplifying the design and reducing the width of the crossing, as shown in Figures S.8 through S.10.

Route 1 (Tobin Bridge) - Southbound.

The traffic movements of the Revised Charles River Crossing and the FSEIS/R Proposed Action are shown in Figures S.11 and S.12, respectively.

- Travelling south on Route 1 (Tobin Bridge) located in Charlestown, the traffic movement to Storrow Drive and I-93 southbound in both the Revised Charles River Crossing and the FSEIS/R Proposed Action is accommodated by viaduct connections with local access connections at Leverett Circle. The Revised Charles River Crossing will have one viaduct loop and the FSEIS/R Proposed Action has two separate viaduct loops.

- Both the Revised Charles River Crossing and the FSEIS/R Proposed Action provide regional connections to the north on viaduct with local access provided to New Rutherford Avenue and Charlestown. The Revised Charles River Crossing also will provide direct local access to Boston Sand & Gravel Company, whereas the FSEIS/R Proposed Action provides no direct access to Boston Sand & Gravel Company.

Traffic movements from Route 1 (Tobin Bridge) southbound to regional and local connections are similar, with the exception that the Revised Charles River Crossing will provide direct local access to Boston Sand & Gravel Company, thereby removing trucks associated with this operation off local streets in Charlestown.

I-93 Southbound.

The traffic movements of the Revised Charles River Crossing and the FSEIS/R Proposed Action are shown in Figures S.13 and S.14, respectively.

- The Revised Charles River Crossing and the FSEIS/R Proposed Action provide traffic movements to Storrow Drive on viaducts and bridges. Both provide local access to east Cambridge and the O'Brien Highway, and downtown Boston via Nashua Street. The Revised Charles River Crossing will provide this movement parallel to the I-93 southbound mainline. The FSEIS/R Proposed Action provides this movement in an indirect route around the viaduct loop connections through east Cambridge, which adds a loop ramp to the interchange.

- The Revised Charles River Crossing will accommodate the I-93 southbound traffic to Route 1 (Tobin Bridge) northbound via a surface road connection under the I-93 southbound mainline with an at-grade signalized intersection that provides local access to New Rutherford Avenue and Boston Sand & Gravel Company. The FSEIS/R Proposed Action provides I-93 southbound traffic to Route 1 (Tobin Bridge) northbound by an indirect route around the viaduct connections through east Cambridge, which adds a loop ramp to the interchange. The FSEIS/R provides local access to Charlestown at City Square.

- The Revised Charles River Crossing will provide an exclusive High-Occupancy Vehicle (HOV) lane on I-93 southbound from Sullivan Square in Somerville to the north bank of the Charles River. The FSEIS/R Proposed Action does not provide for a dedicated HOV lane.

Traffic movements from I-93 southbound to areas to the north and west in the Revised Charles River Crossing will be provided on a structure in east Cambridge that will be less massive and visually intrusive due to the elimination of several loop ramps to the interchange in east Cambridge (see figures S.15 and S.16). The addition of the dedicated HOV lane will improve the operational efficiency of the regional highway network.

I-93 Northbound.

The traffic movements of the Revised Charles River Crossing and the FSEIS/R Proposed Action are shown in Figures S.17 and S.18, respectively.

- The Revised Charles River Crossing will provide traffic movements from I-93 northbound to Storrow Drive westbound by direct tunnel through the North Station area. The FSEIS/R Proposed Action provides this movement by viaduct crossing northbound over the Charles River on the mainline bridge then reversing direction on a loop ramp that crosses southbound over the Charles River on the lower level of the double-decked bridge and through North Station connecting to Storrow Drive. This adds two lanes to the river crossing and another viaduct loop ramp to the interchange in east Cambridge/Charlestown.

- Both the Revised Charles River Crossing and the FSEIS/R Proposed Action provide local connections to east Cambridge and downtown Boston on the south side of the river at Leverett Circle.

- The Revised Charles River Crossing will accommodate I-93 northbound traffic to Route 1 (Tobin Bridge) northbound in a tunnel through North Station and under the Charles River. The FSEIS/R Proposed Action provides this movement by viaduct north of the Charles River, adding another loop ramp to the interchange in east Cambridge/Charlestown.

- North of the Charles River, the Revised Charles River Crossing will provide local access to east Cambridge and Charlestown at New Rutherford Avenue north of the Gilmore Bridge. This movement will remove traffic congestion from the City Square area. The FSEIS/R Proposed Action provides local access at City Square.

- The Revised Charles River Crossing will provide local I-93 access from downtown Boston at New Sudbury Street. The FSEIS/R Proposed Action does not include a local downtown Boston access ramp from Government Center.

The Revised Charles River Crossing will provide traffic movements from I-93 northbound to Storrow Drive through a direct tunnel connection as opposed to the double-crossing of the I-93 mainline bridge in the FSEIS/R Proposed Action, which will reduce VMT. The inclusion of a local downtown Boston access ramp at New Sudbury Street in the Revised Charles River Crossing will improve the operational efficiency of the regional network system. In addition, the Revised Charles River Crossing will decrease local congestion in Charlestown, specifically in the vicinity of City Square, by the relocation of the I-93 northbound to New Rutherford Avenue movement to a location north of Gilmore Bridge.

Storrow Drive.

The traffic movements of the Revised Charles River Crossing and the FSEIS/R Proposed Action are shown in Figures S.19 and S.20, respectively.

- The Revised Charles River Crossing will provide traffic movements from Storrow Drive to I-93 southbound with an at-grade intersection at Leverett Circle, similar to existing conditions. Southbound traffic flow will proceed down a ramp into a tunnel under 100 Nashua Street (the Registry of Motor Vehicles building) and the Massachusetts Bay Transporation Authority (MBTA) Commuter Rail railroad tracks at North Station, and join I-93 just north of Causeway Street. In the FSEIS/R Proposed Action, this Storrow Drive to I-93 southbound requires a northbound traffic movement first on the upper level of the double-decked bridge, across the Charles River, before looping back on a viaduct connection to I-93 southbound which crosses the Charles River on the mainline bridge. As a result, the FSEIS/R Proposed Action adds two additional lanes to the river crossing and one loop ramp to the interchange in east Cambridge/Charlestown.

- The Revised Charles River Crossing will provide traffic movements from Storrow Drive to I-93 northbound and Route 1 (Tobin Bridge) northbound with an at-grade intersection at Leverett Circle, similar to existing conditions. Northbound traffic flow will proceed down a ramp into a tunnel under 100 Nashua Street, loop around northwesterly under the current site of the Minot Station steam generating plant, beneath the MBTA relocated Green Line and under the Charles River in a three-lane tunnel. The FSEIS/R Proposed Action accommodates this movement on the upper level of a double-decked bridge over the Charles River and a loop ramp, which adds another loop ramp to the interchange in east Cambridge/Charlestown.

- The Revised Charles River Crossing and the FSEIS/R Proposed Action include local on-ramps to I-93/Route 1 at Leverett Circle.

The Revised Charles River Crossing will provide access at Lomasney Way/Merrimac Street through the Charles River three-lane tunnel to I-93 and Route 1 northbound. This will allow local downtown Boston traffic another access to points north via the Congress Street arterial. Access from Storrow Drive to I-93 southbound will be more direct in the Revised Charles River Crossing, as opposed to the double-crossing of the I-93 mainline bridge in the FSEIS/R Proposed Action.

Ventilation Building.

- The three-lane northbound tunnel under the Charles River and the land tunnels under the North Station Commuter Rail facility, the Spaulding Rehabilitation Hospital site, and Nashua Street will need one ventilation building located north of the new Boston Garden site for the Revised Charles River Crossing. These tunnels require the relocation of Spaulding Rehabilitation Hospital, which provides an opportunity for substantial open space expansion along the south bank of the Charles River. The FSEIS/R Proposed Action does not include any ventilation buildings in this area because it has no tunnels north of Causeway Street.

Conclusion. The Revised Charles River Crossing successfully addresses the several major concerns raised about the FSEIS/R Proposed Action. It will provide HOV facilities and eliminate the double crossings of the river by traffic between Storrow Drive and the south, reducing vehicle miles travelled and improving air quality. The design will provide a northbound on-ramp in the downtown area which is not present in the FSEIS/R Proposed Action; this improvement will considerably improve local traffic in Keany Square and City Square. Traffic at local intersections will be improved relative to the FSEIS/R Proposed Action. In addition, the Revised Charles River Crossing design preserves Storrow Drive as a parkway, by providing improved an at-grade intersection at Leverett Circle.

The Revised Charles River Crossing will minimize permanent impacts of the highway on the Charles River and its regionally significant open space corridor by reducing the number of bridges and piers. The new bridge will be 113 feet narrower than the three bridges of the FSEIS/R Proposed Action, and the bridge aesthetics will be improved in this prominent location and entry to the City of Boston. The highway interchange connecting I-93, the Tobin Bridge, and Storrow Drive will be simplified, from the FSEIS/R Proposed Action's six loop ramps which rise to over 100 feet high immediately adjacent to the Charles River. The Revised Charles River Crossing will have a single three-lane loop ramp 25 feet high, which will be farther from the river and the development area of east Cambridge, which will reduce both land use and open space impacts. Similar improvements in ramps near City Square in Charlestown will reduce land use and open space impacts in that area of the Revised Charles River Crossing.

In summary, the Revised Charles River Crossing will improve every major aspect of the design and will address the many public and agency comments of the FSEIS/R Proposed Action. As described in the Section 2.2.3, these design changes resulted from additional review directives in the 1991 Massachusetts Environmental Policy Act Certificate and fully complies with the intent of these directives.

2.2 Development Of The Revised Charles River Crossing

The Revised Charles River Crossing has been designed through recommendations of an intensive multidisciplinary/community-based effort. Section 2.2.1 describes the Federal and State environmental review and permitting processes, under which these recommended design changes must be reviewed and approved by regulatory agencies. Sections 2.2.2 and 2.2.3 describe the development of the Revised Charles River Crossing since the FSEIS/R was approved in early 1991.

2.2.1 Environmental Review And Permit Processes

Federal and State environmental laws and regulations require public input into the planning and development of public projects to provide that appropriate consideration and protection is given to the public interest and the environment. NEPA and MEPA are the respective Federal and State laws that cover these interests. Their purpose is to prevent environmental damage and force action by disclosing the impacts of and alternatives to a proposal through coordination and interaction among regulatory agencies and the public. Both laws require the preparation of extensive documentation and associated formal public review if it is determined that a particular project may have significant environmental, economic, or social impacts; their objectives are generally the same, though the paths are different. Each process is described below, concluding with a discussion of a combined process which serves to streamline it while providing for its comprehensiveness.

2.2.1(a) Federal Approval Process

NEPA is the basic national charter for protection of the environment. It prescribes coordination and interaction among agencies and the public for every government sponsored project affecting the environment. Agencies must provide that all actions of the Federal government include appropriate consideration and protection of the public interest through interaction with other agencies . To this end, a lead agency supervises the preparation of an environmental impact statement if more than one Federal agency has regulatory jurisdiction on any aspect of the same project. The lead agency requests all Federal agencies which have an action to take on the project to be "cooperating" agencies. This cooperating agency program encourages: a reduction of paperwork and delay; elimination of duplication with Federal, state, and local procedures and environmental documents; and the integration of NEPA requirements and other Federal environmental review and consultation requirements.

The lead agency for the Central Artery/Tunnel Project is the FHWA. Twenty-seven Federal, State, regional, and local agencies serve as cooperating agencies for this project. Acting as trustees of environmental resources (such as water, lands, wildlife, and air), these agencies must provide that all actions of the Federal government minimize harm to the environment. Based on consultation with these agencies and the interested public over several years, one document, the FSEIS, approved in May 1991, addresses the cumulative concerns of these 27 agencies for the Central Artery/Tunnel Project.

In the near future, the FHWA is expected to initiate the NEPA process for the Revised Charles River Crossing which may result in the requirement to prepare an Environmental Assessment or a supplemental environmental impact statement for this portion of the project. A scoping meeting location and date will be included in a Notice of Intent, to be published in the Federal Register. The purpose of this scoping meeting is for all interested parties to assist FHWA to determine the range of actions, alternatives, and impacts to be considered in further environmental documentation and to identify the significant issues to be analyzed in depth if an EIS is required. The scoping meeting also assists FHWA in identifying and eliminating from detailed study those issues that are not significant or that have already been covered by prior environmental review.

The Department will prepare any requested environmental documentation for the Revised Charles River Crossing, if required by FHWA, and will make it available for public review and comment. The content will be based on the results of the scoping meeting as well as coordination and interaction with public agencies that have regulatory jurisdiction over parts of the project. In addition, the Department will host a series of public meetings in the affected communities to complement interaction with the public agencies.

2.2.1(b) State Approval Process

Under 301 CMR 11.17, if a proposed project changes, the proponent, (i.e., the Department), must notify the Secretary of Environmental Affairs under the MEPA process. The Department begins the MEPA process by preparing and filing a Notice of Project Change with the Secretary of Environmental Affairs, which the Secretary publishes in the Environmental Monitor for review and comment. A review period follows, during which the Secretary receives agency and public comments. At the close of the review period, the Secretary determines whether supplemental environmental documentation is necessary. If no further documentation is required, the Department may act on the Revised Charles River Crossing.

If further documentation is required, the Secretary will determine its scope based on agency and public comment. The documentation is prepared by the Department and submitted to the Secretary. The documentation is reviewed and commented on, at both the draft and final stages, by agencies, the public, the MEPA unit, and the Secretary. After completion of the Secretary's review and approval of the final documentation and expiration of a legal challenge period, MHD may act on the Revised Charles River Crossing.

2.2.1(c) Coordination of Federal And State Approval Processes

As noted in section 2.2.1, MEPA and NEPA's objectives are generally the same, although their paths (or processes) are different. Both laws accommodate the inclusion of environmental review requirements of other agencies. Both laws require similar public review and comment periods. Consequently, it is often possible, practicable, efficient, and economical for NEPA and MEPA's environmental documentation as well as review processes to be consolidated. In other words, relative to the Revised Charles River Crossing, the MEPA and NEPA review processes may proceed in parallel without compromising the comprehensive analysis that will be provided in any subsequent environmental documentation that satisfy both NEPA and MEPA requirements for environmental impact disclosure, assessment, mitigation, and public involvement.

2.2.1(d) Environmental Permit Process

Permit applications in accordance with Federal and State environmental regulations will be prepared during futher design refinements of the Revised Charles River Crossing (75 percent design). Although these design refinements will occur several months after the filing of the NPC, compliance with the Federal wetlands permitting process will begin immediately with the submission of a Need for Project Change filed with the U.S. Army Corps of Engineers (USACE). This is the first milestone in an integrated process named the Highway Methodology which is aimed at coordinating USACE's Section 404 permits with NEPA and streamlining the decision-making processes regarding activities in wetlands under Federal jurisdiction. The Federal wetlands processes will have important implications for the continued planning of the Charles and Millers Rivers elements of the Revised Charles River Crossing. The other milestones of the Highway Methodology will be followed during the preparation of the any further environmental documentation. In addition, the Massachusetts Wetlands Protection Act, Chapter 131 Section 40, will regulate activities in wetlands under State jurisdiction. The Massachusetts Department of Environmental Protection (DEP) and the Boston and Cambridge Conservation Commissions have administrative authority under this Act.

The Area North of Causeway Street contains several acres of flowed or filled tidelands. The Revised Charles River Crossing will be planned to comply with Chapter 91 Waterways Act under the jurisdiction of DEP.

The ventilation building located north of the new Boston Garden site will require compliance with the Clean Air Act Amendments of 1990. This will require filing with the DEP certification regarding the new ventilation building under the State Implementation Plan.

A description of required permits for the Revised Charles River Crossing is in Chapter 5 of this NPC.

2.2.2 MEPA Certificate Directives

Under the Massachusetts Environmental Policy Act, the Final Supplemental Environmental Impact Report for the Central Artery/Tunnel Project was certified on January 2, 1991. The Final MEPA Certificate contains the following points relevant to the FSEIS/R Proposed Action and the Bridge Design Review Committee:

- "The FSEIS/R submitted for the Central Artery/Tunnel Project adequately and properly complies with MEPA and its implementing regulations."

- The Certificate recognizes the long-range, long-lasting improvements which this project will bring about. "The project has extraordinary potential to improve air quality, the environment, improve our ability to commute in and out of the city..., improve recreational opportunities in Cambridge, Boston, and the Harbor, and improve the visual character of downtown Boston and the banks of the Charles River."

- The Department is required to "continue to review modifications and options to the FSEIS/R Proposed Action, which might reduce the environmental and aesthetic impacts of the crossing, and to embark on a process to better inform the public about the crossing."

- "The current I-93/Route 1 interchange...is the most dangerous bottleneck in the United States Interstate Highway system," and the challenges for transportation engineers and designers posed by the Charles River crossing is to accommodate 14 traffic movements in a very confined and densely developed area while protecting parklands and natural resources.

- The Certificate requires formation by the Secretary of Transportation and Construction of the Bridge Design Review Committee, to be "appointed and convened no later than February 1, 1991. This Committee is to consist of citizen members from specific area neighborhoods, representatives of the cities of Boston and Cambridge, State and regional agencies, private area organizations, and area professionals in an effort to develop improvement alternatives to the FSEIS/R Proposed Action."

- The Certificate also affirms in detail and adds to the extensive FSEIS/R mitigation package for the Area North of Causeway Street, making these measures a part of the Proposed Action as certified through the MEPA process.

2.2.3 Bridge Design Review Committee Process

The Bridge Design Review Committee (the Committee) was established by the Massachusetts Secretary of Transportation and Construction, pursuant to the Certificate for the Artery/Tunnel Project FSEIS/R issued by the Massachusetts Secretary of Environmental Affairs. The Committee has 42 members including representatives of EOEA, the Metropolitan District Commission (MDC), the City of Boston, the City of Cambridge, and environmental and community organizations; several of its members are architects and planners. Between February 1, 1991, and September 1992, there have been four executive committee meetings, 19 meetings of the full committee, and 56 meetings of subcommittees and working groups. The Committee was supported by the EOTC, by the Department's management consultants, and by independent experts.

The principal concerns of the Committee are:

- Restore the Traverse Street on-ramp or an equivalent move to reduce additional traffic on local streets and negative noise and air quality impacts.

- Reduce visual impacts of bridge and ramp height/massing to improve visual design.

- Ensure positive development/design of parklands along the Charles River Basin, which is adversely affected by Scheme Z.

- Investigate alternative schemes, including partial and/or full tunnel alternatives, to find a superior solution to the river crossing.

- Reduce negative impacts of bridge piers and overhead structures on aquatic resources and navigation in the Charles and Millers Rivers and on open space along their banks.

- Incorporate/improve nonautomobile transportation, including pedestrian and bicycle routes, ferry service at Lovejoy Wharf, and bus and HOV routes.

- Provide pedestrian and bicycle routes along both banks of the Charles River and connections both to and across the river from Charlestown, Cambridge, and Boston.

- Provide adequate technical support to Committee deliberations.

- Maintain/review all connections to the regional roadway system. Give special consideration to the role played by Storrow Drive in the regional system and maintain its character as part of the Esplanade.

- Minimize construction impacts; maintain road and transit connections during construction.

2.2.3(a) Design Concepts Studied During BDRC Process

The Committee began with a broad spectrum of independent ideas through an open public process. These ideas evolved into 13 options which were analyzed and presented in the summary of the Committee report of October 1991, including schematics of the options considered. (It should be noted that 31 options were studied by the Department before the selection of the Proposed Action in the FSEIS/R. Some of the 13 options studied by the Committee were variants of the original 31.) Nearly all options were considered by the Committee to provide improvements over the FSEIS/R Proposed Action; but all would increase construction cost. Including suboptions, over 20 alternatives were considered, among them two versions of an all-tunnel option. After extensive study, options were narrowed to the following three Committee Improvement Packages (CIPs):

- CIP 3: containing four loop ramps in Cambridge, and a double-deck bridge crossing with Storrow Drive connections on the top level

- CIP 5: containing two loop ramps in Cambridge and a four-lane river tunnel carrying Storrow Drive connections

- CIP 8: a hybrid option of CIPs 3 and 5, with the northbound Storrow Drive connection in river tunnel, and the southbound connection on the bridge as part of the mainline crossing

All of these options have common key features which directly address the Committee's objectives as stated in the MEPA Certificate to "reduce the environmental and aesthetic impacts of the crossing." Of greatest importance are the direct land-based tunnels connecting Storrow Drive with the Central Artery, which reduce local traffic impacts, eliminate the need for double river crossings, and are essential to all other improvements to the Charles River crossing. All CIPs are based on bridge concepts which are designed to avoid parallel bridges of inconsistent profiles, to reduce the overall bridge width, and to simplify the complexity of the FSEIS/R Proposed Action, thereby reducing the number of supporting columns in the Charles River and the visual clutter of columns on land. Substituting tunnel for viaduct in some connections was also a common approach, thereby reducing impacts on adjacent land uses and open space.

Each of the three options which remained (CIPs 3, 5, and 8) have support from the Committee members. The Committee was unanimous that each of these design concepts is a major improvement over the FSEIS/R Proposed Action. It should be noted that these options also contain three specific design features that have unanimous support of the Committee:

- Ramp W-CN function (providing direct access from downtown Boston to I-93 northbound)

- Land based tunnels (to reduce the number of viaduct structures) as a substitute for the double-crossings between I-93 in Boston and Storrow Drive

- Mitigation of visual problems of Scheme Z (e.g., reduction in number of massive viaducts in east Cambridge)

These design features remained in all subsequent design modifications.

Ongoing Design Process. It is imperative for the Department to continue design development of the Central Artery/Tunnel Project as a whole and advance design and construction progress on all project sub areas while the current environmental analysis continues in the Area North of Causeway Street. Accordingly, during the course of environmental review, the Department will continue design development to refine and improve the project in response to identified environmental concerns.

Following the filing of this NPC, the Department will focus its design development resources on both the Revised Charles River Crossing and the FSEIS/R Proposed Action. The Department will examine potential improvements for both designs, however, using design refinements developed during the Committee process. Upon approval of the Revised Charles River Crossing (MEPA Certificate and FHWA Record of Decision) the design development will proceed on that design alone.

Committee Approval of CIP 8.1. After considering variations (called Modifications and abbreviated "Mod") that would reduce loop ramp impacts on the Charles River open space, the Committee voted on June 21, 1991, to recommend CIP 8.1, with nearly as much support being shown for CIP 5.3, a much more costly alternative with additional river-tunnel lanes. (Vote results: CIP 8.1 received 17 votes, CIP 5.3, 15 votes, and CIP 3.1, 6 votes; the balance abstained or were absent out of 42 members.)

Following the vote of the Committee to recommend CIP 8.1, the Department initiated further engineering for those issues requiring further study for this option. During this period, the EOTC briefed the Administrator of the FHWA on the status of the Committee process. Consultation with the cities of Boston and Cambridge and other Committee members also continued during this period. The full Committee continued to meet when necessary.

As a result of this work, four major areas for improvements to CIP 8.1 were identified:

- Both the Committee and EOTC have consistently emphasized during the process that an acceptable solution must contain cost effective and exclusively dedicated HOV systems to promote clean air. None of the options considered in the June 1991 vote included HOV facilities.

- Many of the Committee members, including the City of Boston, the Massachusetts General Hospital (MGH), and others, desired an off-ramp from the northbound Artery to the Leverett Circle/Nashua Street area.

- Any option recommended must fulfill FHWA's obligation to minimize impacts to parkland and historic resources protected by Section 4(f) of the Transportation Act.

- The bridge identified in CIP 8.1 would be difficult to design and construct because of its asymmetry.

Further engineering development by the Department and the Committee concept led to CIP 8.1D. This option addresses the four critical issues listed above, as well as most of the other concerns expressed during the Committee's process.

In summary, CIP 8.1D contains a dedicated HOV lane on I-93 southbound from Sullivan Square in Somerville to the new Charles River bridge in Cambridge. A single-lane ramp has been designed to accommodate northbound Central Artery to Leverett Circle/Nashua Street area through a direct traffic movement. The reduction in bridge size, and of columns and support piers in the river, will improve the value of the Charles River Esplanade parkland and adjacent historic properties. In addition, the acquisition of Spaulding Rehabilitation Hospital and its subsequent relocation will allow visual continuity between the Esplanade and the Lower Charles River Basin, as well as allowing the significant development of more open space and parkland. Although the bridge will require careful staging due to simultaneous tunnel construction and timing with navigational issues, the design represents a more graceful structure and an elegant expression of long-span engineering.

Still remaining at the time of the March 1992 Committee vote were the following specific project design questions. Except where it is indicated that the issue has been fully addressed in the Revised Charles River Crossing, further study will be undertaken during design.

- Bunker Hill Community College land impact: The Revised Charles River Crossing will seriously reduce the impact of the ramp connections to I-93; an impact to the college's athletic facilities remains to be addressed.

- Buffer studies between the highway system and the Charlestown community: Recent improvements will substantially reduce ramps on the Charlestown side of I-93 and create a large development parcel, facilitating buffering by future buildings.

- Use of land created by removal of existing I-93 viaduct: This will be enhanced by the simplification of the ramp design which eliminates all ramps between the I-93 mainlines and New Rutherford Avenue, providing large, useable parcels.

- Grade-separated access to open space from the Charlestown community: A number of options exist to access open space, such as removal of the Ramp L-C signalized intersection.

- New Rutherford Avenue/Central Artery to local streets intersection function: The northbound C-L off-ramp will intercept New Rutherford Avenue north of the Gilmore Bridge, improving traffic conditions in Keany Square, City Square, and New Rutherford Avenue.

- Ability to use the City Square system early: Early use can be made of the City Square tunnels between the Tobin Bridge and the Central Artery local access. This will allow earlier implementation of the City Square master plan.

- Alignment of Leverett Circle deep tunnels and impact on Storrow Drive: No northbound boat section will be the FSEIS/R Proposed Action. Leverett Circle remains a single level intersection except for the existing westbound underpass.

- Leverett Circle urban design characteristics: Boat sections between Nashua Street and Martha Way will be limited, facilitating good design of this area. Platforms above the boat sections and landscaping can address the urban design of this area.

- 4(f) impacts on Esplanade: The Revised Charles River Crossing will require no use of land from the Esplanade and has similar volumes of traffic next to this park as the FSEIS/R Proposed Action.

- Beacon Hill local street system impacts and studies: Traffic analysis to date indicates that traffic on Beacon Hill and Cambridge Street will be marginally reduced compared to the FSEIS/R Proposed Action.

- Preservation of North Station Economic Development Area potential: The Revised Charles River Crossing will require taking the MGH development parcel for tunnels and a ventilation building, but will enhance the remainder of the North Station Development Area. The simplified tunnel configuration will permit joint development on the parcel in the vicinity of and in combination with the ventilation building.

- Current geometric design of the Revised Charles River Crossing will eliminate weaving movements in several locations.

- Buffering of loop ramps from east Cambridge: The Revised Charles River Crossing will reduce ramp height and maximize distance from east Cambridge, providing excellent opportunities to provide an effective buffer with new buildings and landscaping.

- Minimized height of ramps serving Tobin Bridge-Central Artery and Central Artery-local traffic moves: This will be accomplished with the elimination of an upper-level loop ramp and the relocation of a local on-ramp and the relocation of a local off-ramp to New Rutherford Avenue.

- Staging impacts of a single structure: The staging of a single bridge structure, while more complex than a two-bridge option, appears to be workable, and the resultant bridge will offer both aesthetic and environmental advantages to the FSEIS/R Proposed Action alignments.

- Feasibility of Gilmore Bridge on- and off-ramps: The I-93 northbound off-ramp to New Rutherford Avenue and surface intersection for I-93/Route 1 southbound moves appear to be a better design than connections to the congested Gilmore Bridge.

During design, there may be further opportunities to address the remaining issues listed above and to minimize or mitigate impacts. The following more general issues also were raised at the time of the March 1992 vote. The nature of these issues makes it most appropriate to resolve them through detailed studies integrated with the preliminary design of the Revised Charles River Crossing. It is likely that all issues can be addressed through a combination of refinements in design and mitigation measures such as covering boat sections.

- Urban planning and surface traffic impacts of New Sudbury Street on-ramp.

- Leverett Circle deep tunnel configurations.

- Joint development possibilities over Leverett Circle boat sections.

- Storrow Drive/Charles Street Extension corridor study, examining the potential to make the roadway more compatible with adjacent land mass and open space in a manner similar to Memorial Drive.

- State/MGH cooperative technical effort to assess impacts.

In summary, through design work to date and continued studies to address issues, the Revised Charles River Crossing appears to fully address the requirements of the MEPA Certificate and to address the great majority of concerns brought forward in the Committee process.

2.2.3(b) Evolution of the Revised Charles River Crossing Design

During the summer of 1992, further design engineering development by the Department to mitigate certain concerns raised by the City of Boston, the Committee, and FHWA, led to five modifications to CIP 8.1D. The first two modifications referred to as 8.1D "Mod" 1 and 2, respectively, presented alternate locations for the river crossing tunnel within the existing transportation corridor between the new Charles River Dam and the MBTA railroad bridge. These modifications were dropped from further consideration because of constructability problems, deep tunnel excavation requirements, additional right-of-way impacts in the North End, substandard highway geometries and other environmental impacts. Several components, however, resulting from these studies were retained in three additional modifications. These three modifications are referred to as CIP 8.1D Revision 3, CIP 8.1D Revision 4, and CIP 8.1D Revision 5. The three designs and the FSEIS/R Proposed Action are shown in Figures 2.1 through 2.4. The designs share the same characteristics for the I-93 mainlines, bridge structure over the Charles River, a dedicated I-93 southbound HOV lane, a local downtown Boston access ramp to I-93 northbound at New Sudbury Street, the single viaduct loop structure in east Cambridge, the relocation of both the Minot Station steam generating plant and the Spaulding Rehabilitation Hospital, and the opportunity to construct only one ventilation building.

CIP 8.1D Revision 3. The major differences of CIP 8.1D Revision 3 from the other two designs are the locations of the three-lane river tunnel, the connection to I-93 northbound, and the land tunnels and Storrow Drive eastbound regional connections on the south side of the Charles River, as described below:

The three-lane northbound tunnel under the Charles River starts beneath the Spaulding Rehabilitation Hospital on the south bank of the Charles River and proceeds generally north beneath the river just upstream (west) of the bascule bridge to the north bank of the river, just west of the MBTA Commuter Rail railroad tracks.

The I-93 northbound regional connection is in tunnel beneath Boston Sand & Gravel Company, then transitions to meet the I-93 viaduct just north of the Gilmore Bridge.

Storrow Drive eastbound traffic to I-93 and Route 1 northbound is in a tunnel beneath Leverett Circle. Local Leverett Circle to points north movements enter the tunnel via a ramp at the Circle. This tunnel proceeds through the MGH development site and joins the I-93 northbound to Route 1 northbound tunnel to form the three-lane tunnel beneath the Charles River.

Storrow Drive eastbound traffic to I-93 southbound is in deep tunnel beneath Leverett Circle and the previously mentioned tunnel (Storrow Drive eastbound to points north). This tunnel proceeds under 100 Nashua Street (the Registry of Motor Vehicles building), under the tunnel to points north in the MGH development parcel, and under the MBTA railroad tracks before joining I-93 southbound, just north of Causeway Street.

The design at Leverett Circle with multilevel tunnels would require extensive underpinning and disrupt existing parkland along the Charles River west of Leverett Circle. In addition, the geometry of the tunnel connections to the three-lane tunnel beneath the Charles River do not meet design criteria. The connections require abrupt directional changes to separate moves, considered a safety problem by FHWA. Because of the design flaws and impacts, design development Revision 3 was not advanced.

CIP 8.1D Revision 4. The next design, CIP 8.1D Revision 4, includes the following major design elements. The three-lane northbound tunnel under the Charles River starts just east of Leverett Circle at the south bank of the river and proceeds to cross the river at a northeasterly angle to the north bank of the river, but several hundred feet upstream of Revision 3.

The I-93 northbound regional connection is in tunnel beneath the I-93 mainline and transitions in grade to a ramp to meet the I-93 mainline just north of Boston Sand & Gravel Company.

Storrow Drive eastbound traffic to I-93 and Route 1 northbound is in tunnel beneath Leverett Circle, 100 Nashua Street, the Minot Station and loops around to form the three-lane tunnel beneath the Charles River.

Local Leverett Circle traffic to regional connections to the north are also in tunnel beneath the Circle, and looping around the MGH development parcel and converging with the previous tunnel beneath the Minot Station steam plant.

Storrow Drive eastbound traffic to I-93 southbound is in a tunnel parallel to the south bank of the Charles River, beneath the Spaulding Rehabilitation Hospital and the MBTA railroad tracks, and joins I-93 southbound just north of Causeway Street.

This design provides a full limited-access connection to Storrow Drive at Leverett Circle, compromising the latter's role as a parkway. In addition, the design requires extensive tunnel construction under existing and planned parklands, delaying their development and use for recreational purposes. For these reasons design development of Revision 4 was not advanced, but has been modified as described below to eliminate these impacts.

CIP 8.1D Revision 5 (Revised Charles River Crossing). In order to minimize impacts to the parkland along the Charles River Esplanade, the project limits were shifted from Blossom Street to near the existing touchdown points at Leverett Circle, and further design refinements were made to CIP 8.1D Revision 4. In order to meet these criteria, eastbound traffic from Storrow Drive will move through an at-grade signalized intersection at Leverett Circle much the same way it does presently. This design scheme is referred to as CIP 8.1D Revision 5 and includes the following major design elements.

The three-lane northbound tunnel under the Charles River starts just east of Leverett Circle at the south bank of the river and proceeds to cross the river at a northeasterly angle to the north bank of the river.

The I-93 northbound regional connection is in tunnel and transitions in grade to a ramp to meet the I-93 mainline just north of Boston Sand & Gravel Company.

Storrow Drive eastbound traffic to I-93 and Route 1 northbound is provided at an at-grade intersection at Leverett Circle similar to existing conditions. Northbound traffic will proceed down a ramp into a

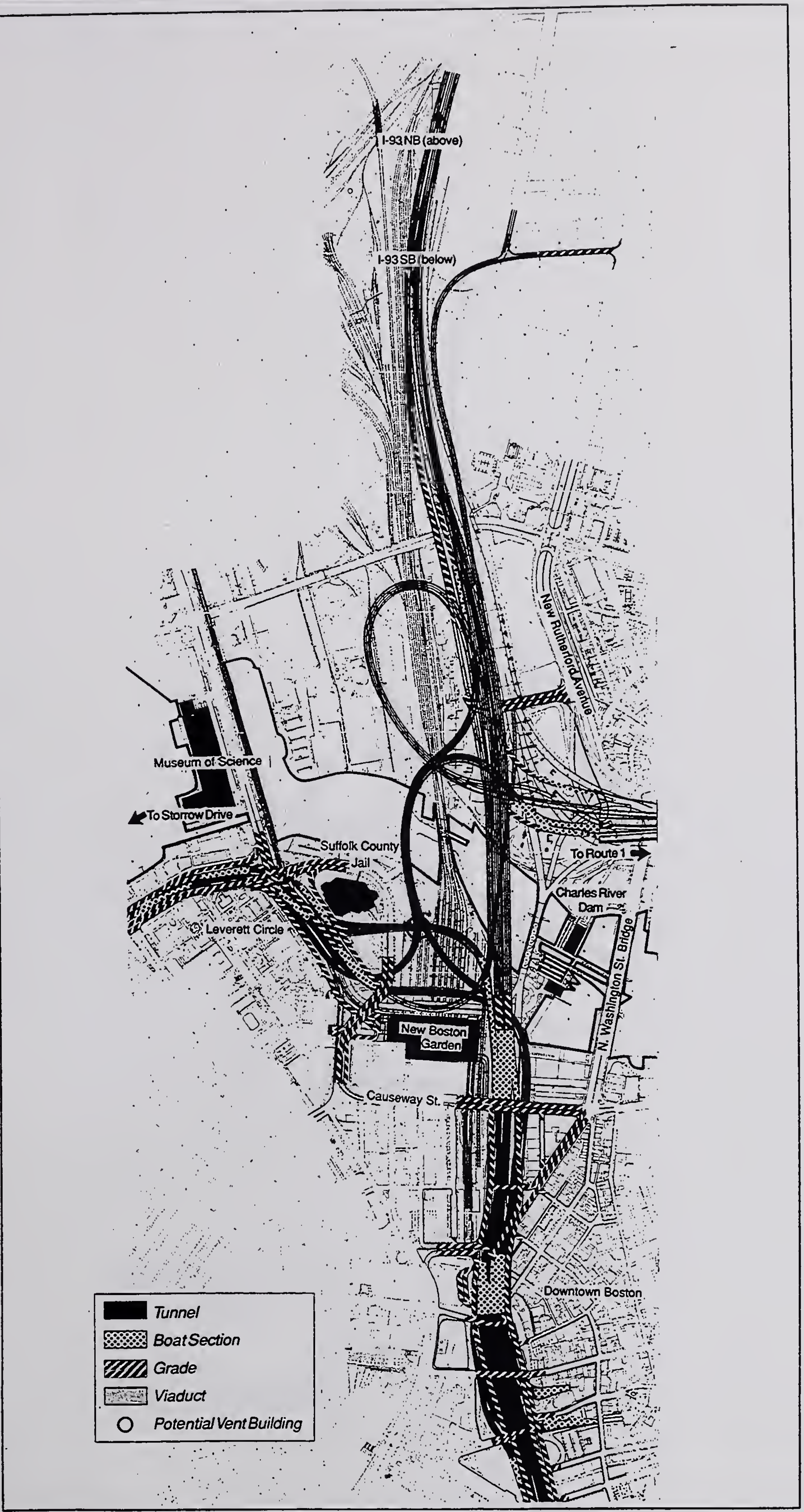


Figure 2.1

CIP 8.1D Revision 3.
Highway Alignment.

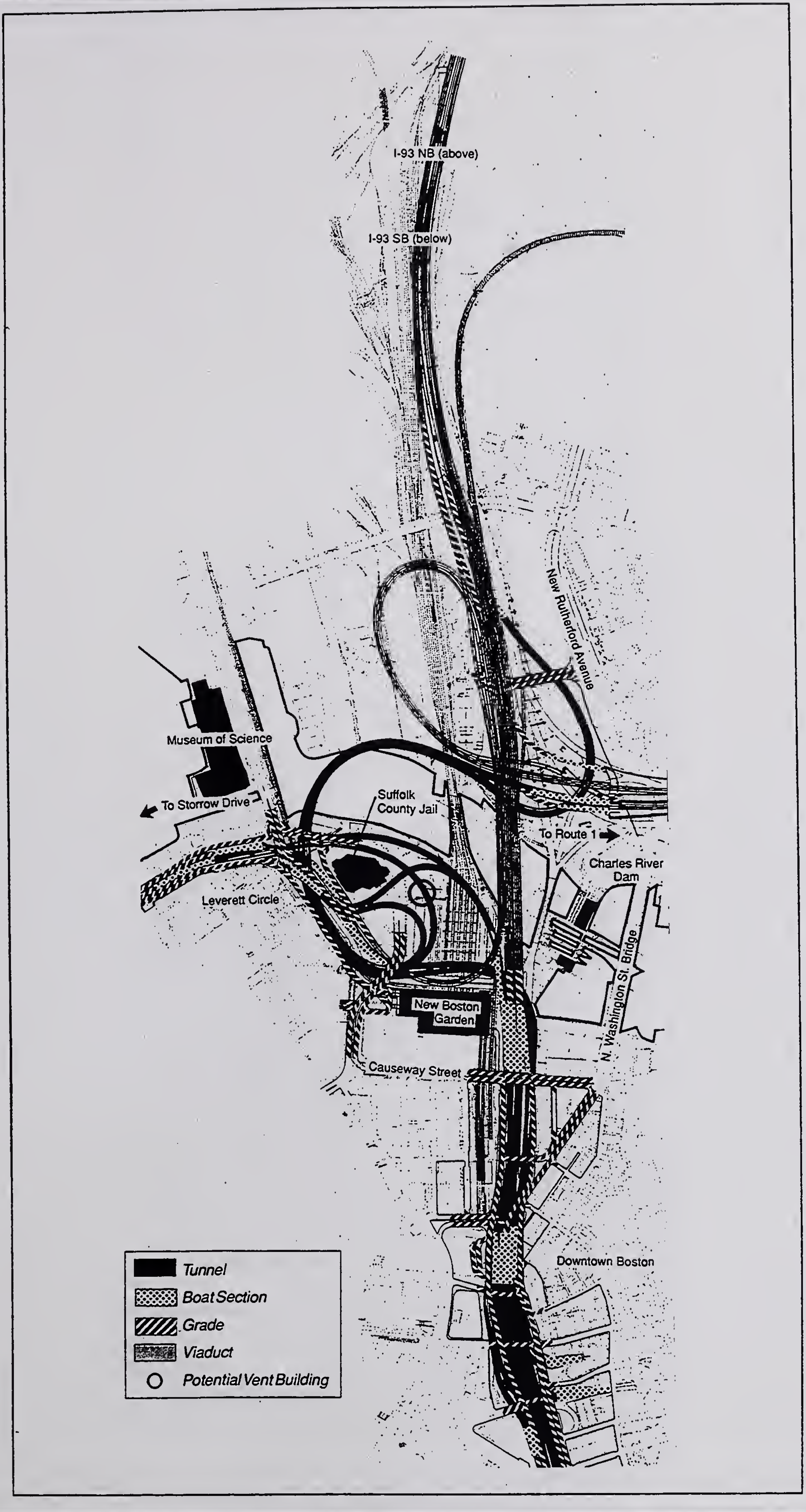


Figure 2.2

CIP 8.1D Revision 4.
Highway Alignment.

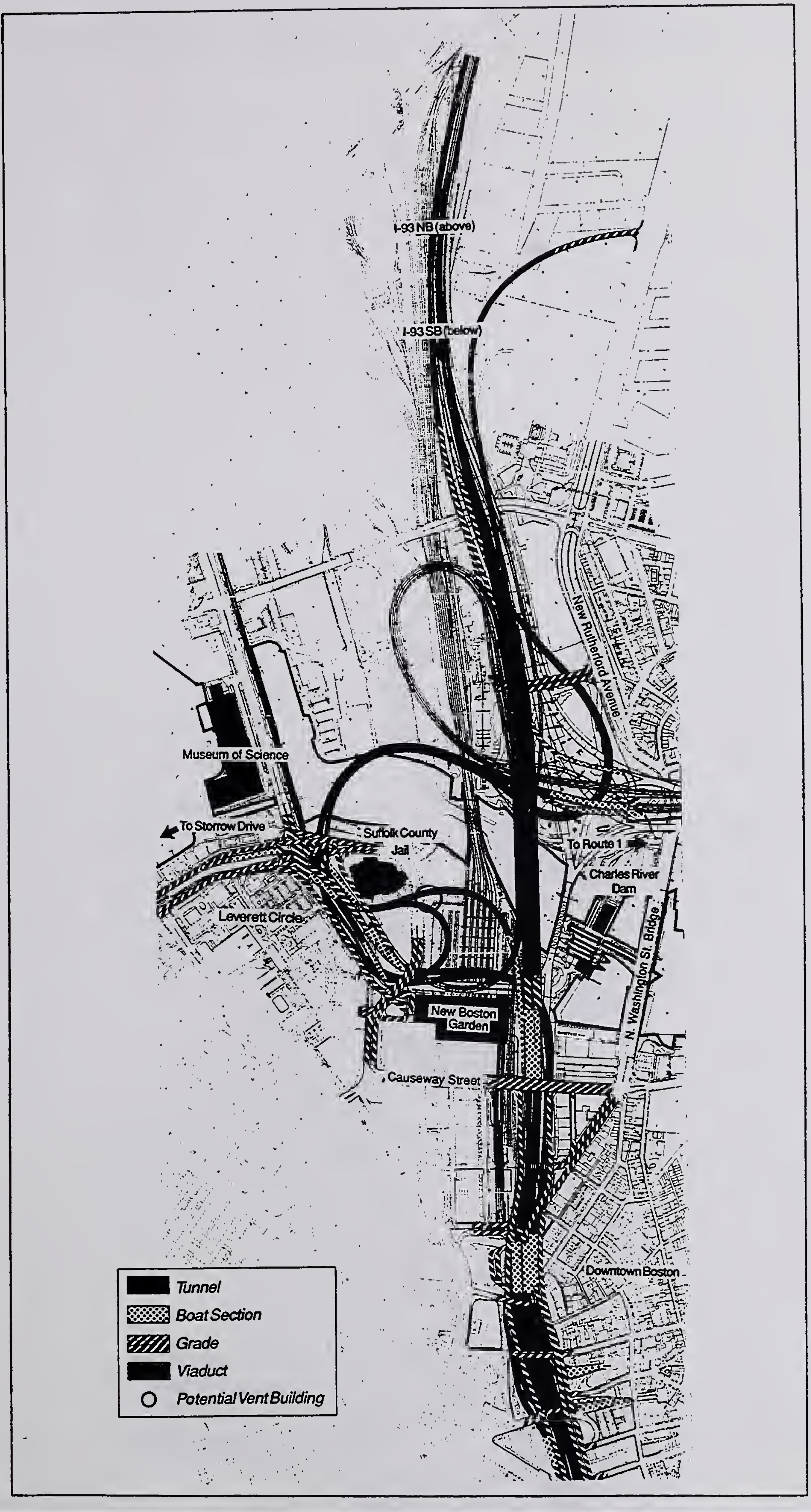


Figure 2.3

CIP 8.1D Revision 5 (Revised Charles River Crossing). Highway Alignment.

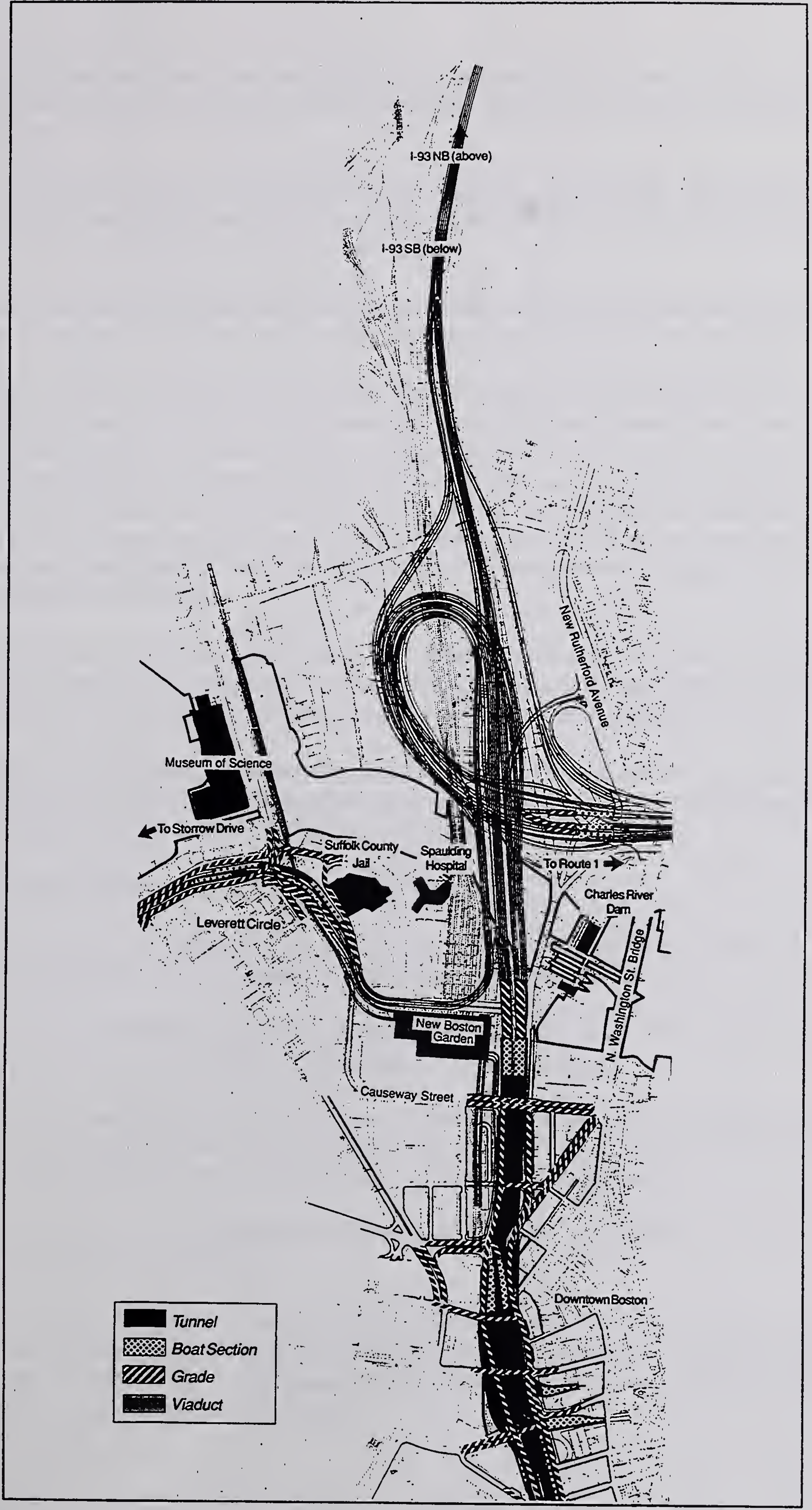


Figure 2.4

FSEIS/R Proposed Action. Highway Alignment.

tunnel under 100 Nashua Street, loop around northwesterly under the present location of the Minot Station steam generating plant, beneath the MBTA relocated Green Line and under the Charles River in a three-lane tunnel.

Storrow Drive eastbound traffic to I-93 southbound is provided at an at-grade intersection at Leverett Circle then proceed down a ramp under 100 Nashua Street and the MBTA Commuter Railroad tracks at North Station and joins I-93 just north of Causeway Street.

Another access from local downtown Boston traffic to points north via the Congress Street arterial will be provided at Lomasney Way/Merrimac Street through the Charles River three-lane tunnel.

Further geometry analysis and design of the Storrow Drive/Leverett Circle intersection will be conducted during the design process to improve traffic operations in the Revised Charles River Crossing. Other outstanding issues that will be evaluated further will include the study of the impacts of an off-ramp to Berkeley Street from the Massachusetts Turnpike (I-90) westbound, and an on-ramp from Arlington Street to I-90 eastbound as a potential mitigation measure to the loss of the eastbound underpass at Leverett Circle. In addition, the Department will commit to coordination with EOTC in the Charles River Arterial Study in concert with the Cities of Boston and Cambridge, the Massachusetts Turnpike Authority and the Metropolitan Planning Organization.

The CIP 8.1D Revision 5 (Revised Charles River Crossing) is similar in most design elements to CIP 8.1D Revision 4, with the exceptions of less tunnel, slight realignment of land tunnels on the south side of the Charles River, and the addition of another local downtown access to Leverett Circle.

A full meeting of the Committee was convened on September 29, 1992, to review the design features of CIP 8.1D Revisions 3, 4 and 5. The Committee voted unanimously (with two abstentions) to support CIP 8.1D Revision 5 as the Revised Charles River Crossing.

2.3 Benefits Of Revised Charles River Crossing

The improved design of the FSEIS/R Proposed Action, incorporated into the Revised Charles River Crossing (CIP 8.1D Revision 5), will have the following substantial benefits:

- It will eliminate the need for the double crossings of the river, thereby facilitating a more direct access between Storrow Drive and the interstate system.

- It will allow the potential development of additional open space and parkland, and promoting visual continuity between the Charles River Esplanade and the Lower Charles River Basin, due to the required aquisition of Spaulding Rehabilitation Hospital.

- It will allow the design of one ventilation building, thereby minimizing the visual impact on the Charles River Esplanade.

- It will decrease traffic on the local street network in the Area North of Causeway Street and over the Charles River on the mainlines, yielding a 2 percent reduction in vehicle miles travelled VMT in the Artery/Tunnel Project area, a reduction of approximately 77,000 VMT daily, or 32 million VMT annually.

- Traffic levels of service* will improve at local intersections, including City Square,Gilmore Bridge, Keany Square, and O'Brien Highway.
- Direct access from downtown to I-93 northbound will be provided at New Sudbury Street.
- A dedicated HOV lane will be added on I-93 southbound north of the river.
- Direct access to New Rutherford Avenue and to the I-93 system for Boston Sand & Gravel will be provided, which will eliminate the need to use the local street system in City Square.
- Air quality levels will improve due to reduced VMT and improved levels of service at key intersections.
- Energy consumption will decrease with the reduction in VMT and better traffic operations.
- Noise levels will be lower at existing Charlestown and Cambridge residences because of the tunnel under the river and because of the narrowing of the bridge structure. Additionally, construction-related noise impacts will be minimized due to the proposed change in land use (i.e., relocation of Spaulding Rehabilitation Hospital).
- The Charles River mainline crossing will decrease from three bridges to one, thereby reducing the bridge crossing width by approximately 113 feet. In addition, there will be one pier in the river (i.e., the west leg of the north tower of the cable-stayed bridge) rather than 11 piers. These design changes will reduce shading of the water surface and substantially improve navigational operations.
- The overall complex of viaducts with attendant piers, columns, and signs will be greatly reduced in the Cambridge/Charlestown area, allowing the driver to negotiate the interchange with a greater sense of certainty.
- Visual benefits will occur with less massive structures, including a narrower bridge, shorter towers, fewer piers in the river, and greatly expanded open space/development opportunities because of the use of tunnels.
- Long-range impacts on Section 4(f) parklands will be superior because of less intrusive ramp structures and a narrower river bridge.
- The Projectwide Wetlands and Waterways Mitigation Program will have the potential to enhance wetlands resource functions and to yield major increases in usable open water areas, including waterways.
- The potential for attractive, clear passage for pedestrians and bicyclists along the banks of the Charles River will be substantially improved.

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* Levels of service (LOS) is a standard measure of operative conditions and is usually measured in terms of volume-to-capacity (V/C) ratio on highways and ramps, and delays in seconds at intersections

Chapter 3

CHANGES IN LONG-TERM ENVIRONMENTAL IMPACTS OF REVISED CHARLES RIVER CROSSING

The changes in long-term environmental impacts from the permanent features of the Revised Charles River Crossing in the Area North of Causeway Street are identified below. Transportation and its impacts on air quality, noise and vibration, and energy are discussed first and compared to those of the FSEIS/R Proposed Action. This is followed by identification of physical/socioeconomic impacts such as economic characteristics, land use and neighborhoods, visual characteristics, parklands, historic resources, and utilities. The chapter concludes with a discussion of impacts on natural resources, such as waterways and wetlands, water quality, and fisheries.

3.1 Transportation And Traffic

Revised traffic forecasts identified in this NPC are based on the same years used in the FSEIS/R: base year 1987; opening year 1998; design year 2010. This will facilitate comparison with the FSEIS/R Proposed Action.

The Revised Charles River Crossing will have the following principal impacts on transportation conditions:

- Traffic volumes will decrease on the local street network in the Area North of Causeway Street, particularly on the Charlestown bridge and connecting roadways, and in City Square in Charlestown. The reduction of surface street traffic near the Charlestown bridge will result primarily from a diversion of northbound traffic from downtown Boston onto the I-93 mainline via the new on-ramp at New Sudbury Street. In addition, traffic volumes in City Square will decline as a result of the new on-ramp, in combination with a change in circulation patterns caused by the relocation of the local northbound exit ramp in Charlestown away from City Square to a location north of the Gilmore Bridge.

- The total volume of all traffic crossing the Charles River will decline by 79,760 vehicles daily. The Revised Charles River Crossing will eliminate the double crossings of the river required for the major traffic moves between the Central Artery and Storrow Drive.

- The southbound HOV lane on I-93 north of the river will provide a substantial improvement in travel conditions for buses and carpools. This will encourage greater use of these modes, rather than less efficient single-occupant vehicles.

In summary, the Revised Charles River Crossing will improve operational efficiency of the regional and local roadway network by removing the double-crossings of the I-93 mainlines over the Charles River, adding a dedicated HOV lane to I-93 southbound on the north side of the Charles River, and providing local downtown Boston access to I-93 northbound in two locations - 1) at New Sudbury Street, and 2) at Lomasney Way. These elements plus other design modifications of the Revised Charles River Crossing improve operating capacities at certain intersections, specifically City Square and Keany Square, and reduce overall VMT by 77,365 daily or 32 million annually over the FSEIS/R Proposed Action. These elements are described in the following sections.

3.1.1 Traffic Conditions

3.1.1(a) Charles River Crossing Traffic Volumes

At the Charles River crossing in year 2010, the expressway facilities (mainline highway and tunnel connectors to the Tobin Bridge and Storrow Drive) included in the Revised Charles River Crossing will carry approximately 148,000 vehicles in the northbound direction, and 141,600 vehicles in the southbound direction, on an average weekday (see Table 3.1). This represents an increase of 4 percent above the average weekday daily traffic (AWDT) that would use the expressway facilities with the FSEIS/R Proposed Action, not including the excess travel caused by the circuitous double river crossings.

The increase in daily expressway traffic associated with the Revised Charles River Crossing will result primarily from the diversion of vehicles away from the local street system, which is reflected in the reductions in AWDT forecast for the local bridge crossings of the Charles River. The Charlestown bridge will carry approximately 50,654 vehicles daily with the Revised Charles River Crossing, compared to 56,540 with the FSEIS/R Proposed Action, a reduction of 10 percent. AWDT also will decline by 20 percent on the old Charles River dam roadway and by 1 percent on the Longfellow Bridge.

Considering both expressway and local street traffic volumes, the Revised Charles River Crossing will result in an overall reduction of 1 percent in weekday daily traffic volumes in both directions over all the Charles River crossings, exclusive of the elimination of double river crossings of the Proposed Action described above. Accounting for the double crossing, the Revised Charles River Crossing will reduce total daily crossing volume by 80,500 vehicles.

3.1.1(b) Mainline Bridge Traffic Volumes

With the elimination of the double river crossings of the Central Artery to/from Storrow Drive connections, and the provision of the Central Artery to Tobin Bridge movement in the northbound Storrow Drive tunnel, traffic volumes will be lower in both directions of the mainline highway bridge of the Revised Charles River Crossing, compared to the FSEIS/R Proposed Action. For these reasons, it is possible to reduce the width of the bridges over the Charles River from five mainline lanes in each direction for the FSEIS/R Proposed Action, to four mainline lanes in each direction for the Revised Charles River Crossing, while maintaining adequate traffic capacity.

3.1.1(c) Leverett Circle-Storrow Drive-Charles Circle Traffic Volumes

In order to facilitate the goals of the MDC in developing the Charles River Esplanade into continuous open space and parkland, the Department is committed to maintaining Storrow Drive as a parkway. Accordingly, an at-grade intersection at Leverett Circle, similar to existing conditions, will be included as part of the Revised Charles River Crossing design. Maintaining Storrow Drive as a parkway, however, will require exploring other options to relieve downtown Boston traffic seeking access to the regional highway system. An option that will be analyzed in the subsequent permitting and design process of the project will be the impacts of an off-ramp to Berkeley Street from the Massachusetts Turnpike (I-90) westbound and an on-ramp from Arlington Street to I-90 eastbound, as a potential mitigation measure to the loss of the eastbound underpass at Leverett Circle. In addition, EOTC commits to study impacts to Charles River arterial roadways as described in Section 6.7, in concert with other metropolitan transportation agencies including the Central Transportation Planning Staff (CTPS), MDC, and the Massachusetts Turnpike Authority (MTA).

At Leverett Circle, total AWDT traffic volumes in the tunnel section and on surface roadways will slightly increase, with a net difference of 2.7 percent more vehicles daily in the Revised Charles River Crossing compared to the Proposed Action (see Table 3.2). The eastbound tunnel under Leverett Circle in the FSEIS/R Proposed Action has been removed in order to maintain Storrow Drive as a parkway.

The FSEIS/R Proposed Action contains connections between Storrow Drive/Leverett Circle and the Central Artery that require double crossings of the Charles River. By removing the double crossings, as in the Revised Charles River Crossing, a small volume of traffic routed elsewhere in the FSEIS/R Proposed Action will return to the Leverett Circle area.

On Charles Street Extension approaching Leverett Circle, the total AWDT volume will increase for the Revised Charles River Crossing compared to the FSEIS/R Proposed Action; total two-way traffic will increase by 4.7 percent. The total eastbound volume will be 2.3 percent lower and the total westbound volume approximately 11.0 percent higher.

At Charles Circle, the total AWDT volume is separated into surface and underpass volumes. On the roadways entering and exiting Charles Circle at grade, the total surface volumes will be approximately 8.4 percent lower for the Revised Charles River Crossing compared to the FSEIS/R Proposed Action. On the roadway segments of Storrow Drive passing under the Longfellow Bridge, the total volumes will be 8.3 percent higher for the Revised Charles River Crossing compared to the FSEIS/R Proposed Action. For the combination of both surface and underpass roadways, the total volumes will be slightly higher at 1.4 percent for the Revised Charles River Crossing compared to the FSEIS/R Proposed Action.

3.1.1(d) Intersection Traffic Volumes

The impact of the changes in design, in terms of reducing traffic on local streets, is illustrated in the comparison of AWDT at major intersections within the area of analysis (see Table 3.3). This area includes downtown Boston north of State Street, Beacon Hill/West End, Charlestown, and east Cambridge/Somerville.

The addition of a northbound on-ramp to I-93 from New Sudbury Street will reduce traffic on the Charlestown bridge and connecting streets. As a result of this design change, in combination with the relocation of the Charlestown local off-ramp to a point on New Rutherford Avenue north of the Gilmore Bridge, AWDT will decline by 8 percent at Keany Square, 23 percent at City Square, and 10 percent at the intersection of New Rutherford Avenue and the Gilmore Bridge.

A new intersection will be developed where the I-93 northbound off-ramp meets New Rutherford Avenue north of the Gilmore Bridge and the Bunker Hill Community College building. This will result in a substantial diversion of traffic away from the more congested City Square intersection where this off-ramp is located in the FSEIS/R Proposed Action. This proposed location will be an advantage because the traffic from the off-ramp can be better accommodated at the new location than at City Square. The new intersection will allow high traffic demand movements to be accommodated by right turns rather than by left turns at City Square. Left turns will also be accommodated at the new intersection, which will be signalized. In addition, the new intersection will be designed to accommodate movements in and out of the adjacent industrial park to the north and accommodate safe pedestrian passage from approximately Essex Street across New Rutherford Avenue. Currently, a pedestrian crossing does not exist in this location.

At the intersection of Gilmore Bridge and O'Brien Highway in east Cambridge, total daily traffic volumes will be 6 percent lower. While the daily volume will increase by 2 percent at the Causeway Street intersection with Merrimac Street, reductions in traffic of 8 and 11 percent will occur at the Causeway Street intersection with the Surface Artery northbound and southbound, respectively. The small increase of traffic at the Causeway/Merrimac Street intersection is related to the addition of the tunnel at Lomasney Way.

3.1.1(e) Intersection Traffic Operations

The Revised Charles River Crossing will cause a substantial shift in traffic away from the local roadway network and onto the expressway system; traffic operations on surface streets are generally expected to improve in comparison to the FSEIS/R Proposed Action (see Table 3.4). LOS will improve during both the A.M. and P.M. peak hours at City Square and Keany Square. Traffic analysis indicates a decrease in LOS at Leverett Circle during the PM peak hour, because of additional traffic movements provided.

3.1.1(f) Vehicle Miles Of Travel

VMT is a measure of the cumulative distance travelled by all vehicles within a designated area. VMT has been analyzed for this document for the relevant area of influence for the Charles River crossing. As shown in Table 3.5, the Revised Charles River Crossing will result in a total roadway reduction of approximately 77,000 VMT per day (or about a 2 percent reduction) for the entire Artery/Tunnel Project area, compared to the FSEIS/R Proposed Action. A similar percentage reduction in VMT is expected to occur for the A.M. and P.M. peak hours.

In the Area North of Causeway Street, Beacon Hill, and other areas close to the Charles River, the VMT reductions will represent a higher percentage of total VMT, with a 5 percent reduction for the combination of all roadways within the affected areas. The expressway reductions will be due primarily to the elimination of the double river crossings, while the local street reductions will be due to the provision of the New Sudbury Street to I-93 northbound on-ramp and the local I-93 northbound off-ramp to New Rutherford Avenue north of the Gilmore Bridge.

Preliminary analyses for vehicle hours of travel (VHT) indicate that for the A.M. and P.M. peak hour periods, an increase in expressway/ramp VHT for the Revised Charles River Crossing will be offset by a decrease in VHT on the local street system, due to the larger volumes on the expressway/ramp system and the smaller volumes on the local street system, reflecting a substantial improvement in traffic operating conditions.

3.1.1(g) Hazardous Cargo Routing

The Revised Charles River Crossing will not substantially alter hazardous cargo routes compared to the FSEIS/R Proposed Action (see Figures 3.1 and 3.2) Under all designs, hazardous cargo vehicles will be prohibited from underground segments of the Central Artery. The primary route between downtown and the north (I-93 and Tobin Bridge) will continue to be the Charlestown bridge to New Rutherford Avenue. Access to the Tobin Bridge will be via the CANA City Square tunnel system, as identified in the FSEIS/R Proposed Action. CANA tunnels will permit hazardous cargo trucks.

The Revised Charles River Crossing will take several moves which are on viaducts in the FSEIS/R Proposed Action and places them in tunnels. These include moves in both directions between Storrow Drive and the Central Artery, and from Storrow Drive westbound to I-93/Route 1 (Tobin Bridge) northbound. The I-93 southbound to Storrow Drive westbound movement remains on viaduct as in the FSEIS/R Proposed Action.

Changing these movements from viaduct to tunnel will not alter hazardous cargo routing since these vehicles are currently prohibited from the Central Artery tunnels and Storrow Drive. The main route for hazardous cargo vehicles to and from the north will remain the Charlestown bridge which will continue to provide access to both I-93 and the Tobin Bridge without travel through a Central Artery tunnel section. Access to the Tobin Bridge will be via the CANA City Square tunnel system, aas identified in the FSEIS/R Proposed Action. CANA tunnels will permit hazardous cargo trucks.

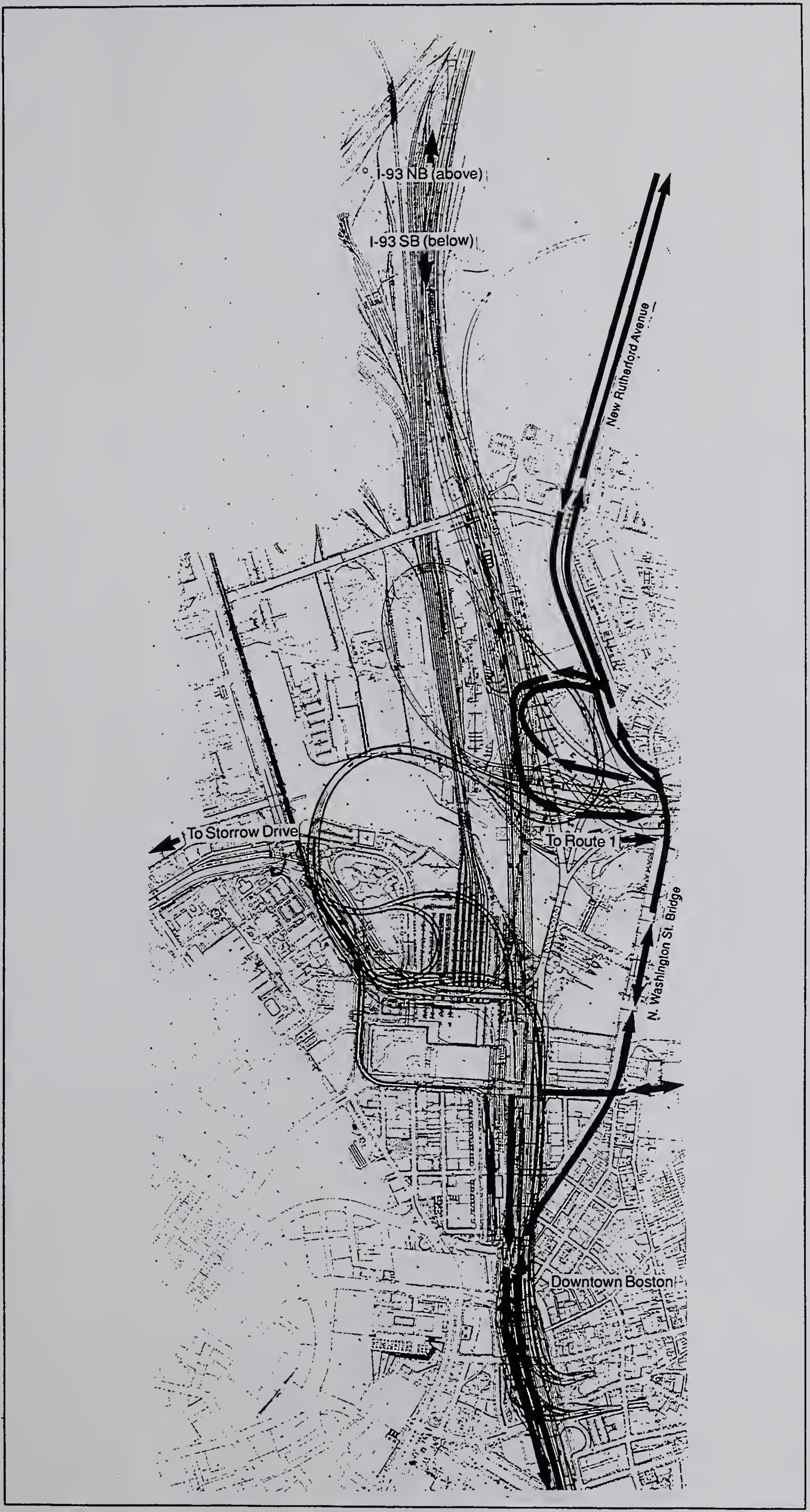

Figure 3.1

Hazardous Cargo Route
Revised Charles River Crossing.

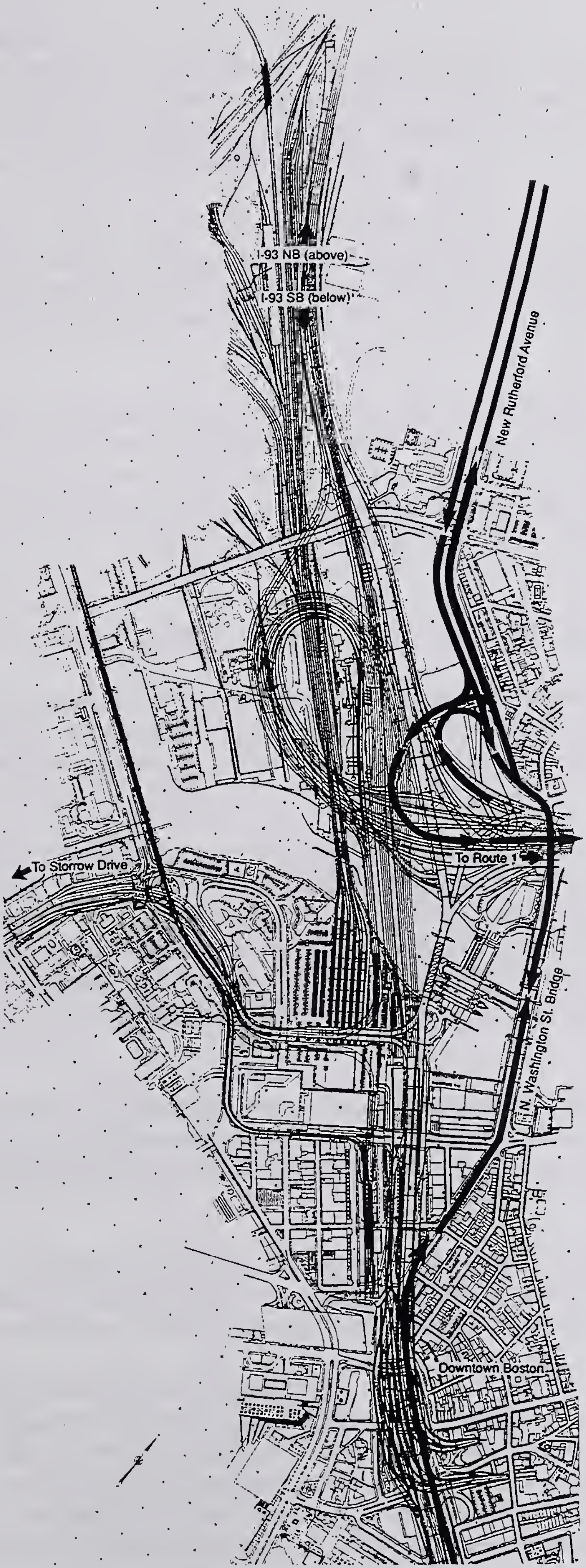

Figure 3.2

Hazardous Cargo Route
FSEIS/R Proposed Action.

3.1.2 HOV Operations

The Revised Charles River Crossing will incorporate a southbound HOV lane on the I-93 mainline between Sullivan Square and the Charles River bridge, a distance of approximately 1 mile, in a manner similar to the current HOV system on this roadway segment. The lane will be open to buses, vanpools, taxis, airport limousines, and carpools with multiple occupants.

The HOV lane will carry approximately 39,520 people in 15,200 vehicles on an average weekday, for an average of 2.6 persons per vehicle. This compares to an average of approximately 46,020 single-occupant vehicles in the southbound general purpose lanes. HOVs will constitute 25 percent of all vehicles on this segment of the highway, but will carry 46 percent of the total number of persons travelling.

The HOV facility will result in improved travel times and greater travel reliability for buses, carpools, and other eligible vehicles, and provide for a bypass of potential congestion associated with the merge of the Tobin Bridge entrance ramp onto the southbound I-93 mainline. This represents a substantial advantage relative to the FSEIS/R Proposed Action, which does not include a mainline HOV lane, in that it will increase effective capacity on the highway system, defined in terms of person movement.

3.1.3 Parking Facilities

There are no differences between the alternatives in long-term impacts on parking facilities in this area.

3.1.4 Public Transportation And Pedestrian And Bicycle Circulation

The new HOV lane on the I-93 southbound mainline will improve bus access to Government Center. There will be no other long-term impacts to public transportation due to the Revised Charles River Crossing.

Existing and planned pathways for pedestrians and bicycles line both banks of the Charles River near the I-93 crossing. The principal impact of the Revised Charles River Crossing relative to the FSEIS/R Proposed Action will be to narrow the footprint of the bridge and ramp structures, such that the overhead highway will cover a smaller section of pedestrian and bicycle pathways, improving ground-level views and enhancing design/landscaping opportunities. In addition, the new design will require fewer piers and abutments that could obstruct circulation at ground level, although such impediments also are minor for the FSEIS/R Proposed Action.

The opportunity for development of more open space along the north and south banks of the Charles River and the visual continuity created between the Charles River Esplanade and the Lower Charles River by the relocation of Spaulding Rehabilitation Hospital will greatly improve the area for pedestrians and bicyclists.

The Revised Charles River Crossing will maintain the continuity of open space along the south bank of the Charles River by creating the opportunity for the MDC in the development of their Master Plan to provide a pedestrian link between the old Charles River Dam and the Charles River Locks and Dams.

3.1.5 North Station/South Station Rail Link

The Department has been supportive of the concept of linking railroad service between North Station and South Station terminals. During the deliberations of the Committee, the Department accepted the recommendation of the Committee that the Congress Street alignment for this railroad link be adopted for further consideration. The Department has also actively participated in the Federal transit study of the North Station/South Station Rail Link Study, and looks forward to its recommendations. The critical issue in providing space for the future rail link is to make certain that the highway tunnel elevations in crossing the Charles River are not too low as to preclude the feasibility of constructing the rail facility.

During the course of the Federal Transit Authority study, the Department recommended that the Congress Street alignment be in a deep bored tunnel since it would be the most compatible with the Artery/Tunnel Project, as well as providing for the highest design standards for both projects. The Revised Charles River Crossing accommodates an alignment through the interchange as shown in Figures 3.3 and 3.4.

The Revised Charles River Crossing allows the top of the future rail tunnel to be located just below the mudline elevation. The Charles River tunnel (Ramps C-T/S-N) crosses the centerline of the Charles River in a location some 900 feet west of the bascule bridge. This ramp rises steeply such that the top slab of the tunnel will be designed to approach an elevation of approximately 100 feet (project datum) and the botton slab at an elevation of approximately 75 feet. A railroad tunnel which passes under the mudline at the centerline of the Charles River near the bascule bridge would, ideally, have a top slab elevation of 78 feet (project datum). Thus, this configuration of tunnels appears to be compatible with the vertical requirements for each of the two projects at this conceptual level of design.

The other land-based tunnels on the south side of the river also accommodate the vertical clearances of the future rail link. Ramps S-CS, L-CS, and CN-S are all very close to the surface and should be far above the elevations of a deep bored tunnel. Ramp C-T is the lowest tunnel in the area and the design will accommodate a vertical crest curve over the rail tunnel alignment shown on Figure 3.6. The grades of Ramp C-T should be sufficiently high to be compatible with a Congress Street deep bored tunnel in the indicated alignment.

Therefore, two planning goals appear to be achieved: maximize the elevation of the rail link tunnel, and minimize the impact of the Revised Charles River Crossing design on the future rail facility.

3.2 Air Quality

The air quality impacts associated with the Revised Charles River Crossing will be directly related to the emissions from motor vehicle exhaust. The changes in traffic volumes, speeds, and levels of congestion will affect the quantities and dispersion of these pollutants.

3.2.1 Qualitative Assessment

In general terms, the air quality effects of the Revised Charles River Crossing are expected to be beneficial when compared to the FSEIS/R Proposed Action. The reason for this assumption is that the design changes will cause a shift in traffic away from the local roadway network onto the expressway system. This improved traffic flow and decreased VMT should result in overall decreases in air pollution.

3.2.1(a) Carbon Monoxide Levels

Traffic volumes on the local streets are expected to be reduced at several key intersections in the Area North of Causeway Street including the Charlestown bridge, Keany Square, City Square, the Gilmore Bridge, and O'Brien Highway.

Relatively high concentrations of carbon monoxide (CO) levels are typically found near congested intersections and along heavily used roadways carrying slow moving traffic. This reduction of traffic volumes, and consequent improvement of LOS should lead to localized reductions in CO levels at most of these intersections. This type of improvement might not occur at every intersection. Documentation of CO levels at key intersections will be developed during permitting or the supplemental environmental analysis process, for the most critical intersections that will be affected by the design change.

Table 3.1

CHARLES RIVER CROSSING SCREENLINE TRAFFIC VOLUMES

Average Weekday Traffic Volumes (2010)	FSEIS/R Proposed Action	Revised Charles River Crossing	RCRC less Proposed Action	
			Volumes	Percent
Northbound Express Facilities				
I-93 Mainline	99,168	88,428	-10,740	-12.5%
I-93 Mainline - CA-NB to SD-WB	19,805	N/A	N/A	N/A
Total	**118,973**	**88,428**	**-30,545**	**-27.0%**
Storrow Connectors				
Storrow to I-93N/Tobin	39,488	40,011	523	1.3%
Double Crossing SD-EB to CA-SB	18,379	N/A	N/A	N/A
CA-NB to Tobin	N/A	19,577	N/A	N/A
Totals	**57,867**	**59,588**	**1,721**	**3.0%**
Express Totals				
Express with Double Crossing	176,840	148,018	-28,824	-16.3%
Express without Double Crossing	138,656	148,018	9,364	-6.8%
Local Bridge Crossings				
Charlestown Bridge	29,067	23,726	-5,341	-18.4%
Charles River Dam	22,510	17,761	-4,749	-21.1%
Longfellow Bridge	14,672	14,170	-502	-3.4%
Local Totals	**66,249**	**55,657**	**-10,592**	**-14.5%**
Northbound Totals				
With Double Crossings	243,089	203,673	-39,416	-16.2%
Double Crossing Totals	38,184			
Without Double Crossings	204,905	203,673	-1,232	-0.6%

Table 3.1 (Cont.)

CHARLES RIVER CROSSING SCREENLINE TRAFFIC VOLUMES

Average Weekday Traffic Volumes (2010)	FSEIS/R Proposed Action	Revised Charles River Crossing	RCRC less Proposed Action	
			Volumes	Percent
Southbound Express Facilities				
I-93 Mainline	102,742	102,298	-444	-0.4%
I-93 Mainline - SD-EB to CA-SB	18,379	N/A	N/A	N/A
Total	**121,121**	**102,298**	**-18,823**	**-15.5%**
Storrow Drive Connectors				
I-93N/Tobin to Storrow	37,153	40,139	2,986	8.0%
Double Crossing CA-NB to SD-WB	19,805	N/A	N/A	N/A
Total	**56,958**	**40,139**	**-16,819**	**-29.5%**
Express Totals				
Express With Double Crossing	178,079	142,437	-35,642	-20.0%
Express Without Double Crossing	139,895	142,437	2,542	1.8%
Local Bridge Crossings				
Charlestown Bridge	27,469	27,318	-151	0.5%
Charles River Dam	25,226	20,658	-4,568	-18.1%
Longfellow Bridge	17,251	16,774	-477	2.8%
Local Totals	**69,946**	**64,750**	**-5,196**	**-7.4%**
Southbound Totals				
With Double Crossings	248,025	207,187	-40,838	-16.5%
Double Crossing Totals	38,184			
Without Double Crossings	209,841	207,187	-2,654	-1.3%

Source: Bechtel/Parsons Brinckerhoff

Table 3.2

LEVERETT CIRCLE-CHARLES STREET EXTENSION-CHARLES CIRCLE

Average Weekday Traffic Volumes (2010)	FSEIS/R Proposed Action	Revised Charles River Crossing	RCRC less Proposed Action	
			Volumes	Percent
Leverett Circle				
Tunnel Movements				
North to Storrow	28,314	23,128	2,408	8.7%
South to Storrow	12,816	22,110	8,093	63.1%
Storrow to North	30,998	N/A	-6,095	-19.7%
Storrow to South	7,788	N/A	5,533	71.3%
Subtotal Tunnel	**79,916**	**45,239**	**9,989**	**12.5%**
Surface Movements				
North to Leverett	8,840	17,011	151	1.7%
South to Leverett	6,989	14,961	5,561	79.6%
Charles St Extension	10,323	10,174	4,218	16.0%
Nashua Street	18,549	12,078	-3,647	-19.7%
Charles River Dam	25,226	20,658	-5,175	-20.5%
Subtotal Surface	**86,028**	**114,123**	**1,108**	**1.3%**
Total	**165,944**	**175,823**	**11,097**	**6.7%**
Charles Street Extension (Between Leverett Circle and Charles Circle)				
Eastbound				
Tunnel	38,776	39,241	-552	-1.4%
Surface	26,424	10,174	4,218	16.0%
Subtotal Eastbound	**65,200**	**49,415**	**3,666**	**5.6%**
Westbound				
Tunnel	41,130	45,239	10,551	25.7%
Surface	22,318	22,852	-5,593	-25.1%
Subtotal Westbound	**63,448**	**68,091**	**4,958**	**7.8%**
Total Tunnel	**79,906**	**45,239**	**9,999**	**12.5%**
Total Surface	**48,742**	**72,267**	**-1,375**	**-2.8%**
Total 2 Way	**128,648**	**117,506**	**8,624**	**6.7%**
Charles Circle				
Surface volumes	73,827	73,596	-231	-0.3%
Underpass volumes	104,445	95,145	-9,300	8.9%
Total	**178,272**	**168,741**	**-9,531**	**-5.3%**

Source: Bechtel/Parsons Brinckerhoff

Table 3.3

SUM OF INTERSECTION TRAFFIC VOLUMES

Average Weekday Traffic Volumes (2010)	FSEIS/R Proposed Action	Revised Charles River Crossing	RCRC less Proposed Action	
			Volumes	Percent
Intersections				
New Rutherford at C-L Off Ramp at BHCC	67,033	77,546	10,513	15.7%
New Rutherford at Gilmore Bridge				
Surface volumes	46,255	46,574	319	0.7%
Underpass volumes	50,375	40,940	-9,435	-18.7%
Subtotal	96,630	87,514	-9,116	-9.4%
New Rutherford at Boston Sand & Gravel	75,305	72,923	-2,382	-3.2%
City Square	108,660	86,744	-21,916	-20.2%
Keany Square	68,576	63,654	-4,922	-7.2%
O'Brien at Gilmore Bridge	81,527	75,556	-5,971	-7.3%
Causeway at Merrimac	57,280	61,960	-4,680	-8.2%
Causeway at Surface Artery Southbound	47,951	41,864	-6,087	-12.7%
Causeway at Surface Artery Northbound	35,933	31,994	-3,939	-11.0%

Source: Bechtel/Parsons Brinckerhoff

Table 3.4

INTERSECTION LEVELS OF SERVICE

AM Peak Hour

	FSEIS/R Proposed Action		Revised Charles River Crossing		RCRC less Proposed Action
Intersection Name	**LOS**	**Delay**	**LOS**	**Delay**	**Delay**
New Rutherford at C-L Off Ramp north Gilmore	N/A	N/A	E	41	N/A
New Rutherford at Gilmore Bridge	N/A	N/A	C	21	N/A
New Rutherford at Boston Sand & Gravel	N/A	N/A	C	17	N/A
City Square	F	146	E	48	-98
Keany Square	E	57	F	109	52
O'Brien at Gilmore Bridge	F	225	F	185	-40
Leverett Circle	C	23	E	51	28
Causeway at Merrimac/Lomasney	D	39	E	53	14

Table 3.4 (Cont.)

INTERSECTION LEVELS OF SERVICE

	PM Peak Hour				
	FSEIS/R Proposed Action		Revised Charles River Crossing		RCRC less Proposed Action
Intersection Name	**LOS**	**Delay**	**LOS**	**Delay**	**Delay**
Ruthford at C-L Off- Ramp north Gilmore	N/A	N/A	C	21	N/A
Rutherford at Gilmore Bridge	N/A	N/A	C	22	N/A
Rutherford at Boston S&G	N/A	N/A	C	20	N/A
City Square	F	119	D	26	-93
Keany Square	F	158	F	90	-68
O'Brien at Gilmore Bridge	F	167	F	191	24
Leverett Circle	C	19	F	217	198
Causeway at Merrimac/Lomasney	D	30	D	39	9

N/A designates an intersection not reported in the 1991/92 FSEIS/R.

Source: Bechtel/Parsons Brinckerhoff

Table 3.5

VEHICLE MILES OF TRAVEL (VMT) 2010

Total Traffic - All Roadways	FSEIS/R Proposed Action	Revised Charles River Crossing	RCRC less Proposed Action	
			Hours	Percent
# - District				
1 Government Center	53,453	52,604	-849	-2%
2 Finanical District	46,640	45,538	-1,102	0%
3 North End	173,332	196,162	22,830	13%
4 North Station	225,679	227,394	1,716	1%
5 West End	92,205	92,525	320	0%
6 Beacon Hill	119,857	116,499	-3,359	-3%
22 Charlestown	709,363	619,845	-89,518	-13%
23 Navy Yard	26,003	23,652	-2,351	-9%
24 Cambridge/Somerville	464,565	461,173	-3,392	-1%
Subtotal	**1,911,096**	**1,835,392**	**-75,705**	**-4%**
Remainder of Project Area	3,189,577	3,166,277	-23,300	-1%
Projectwide Total	**5,100,673**	**5,001,669**	**-99,004**	**-2%**

Source: Bechtel/Parsons Brinckerhoff

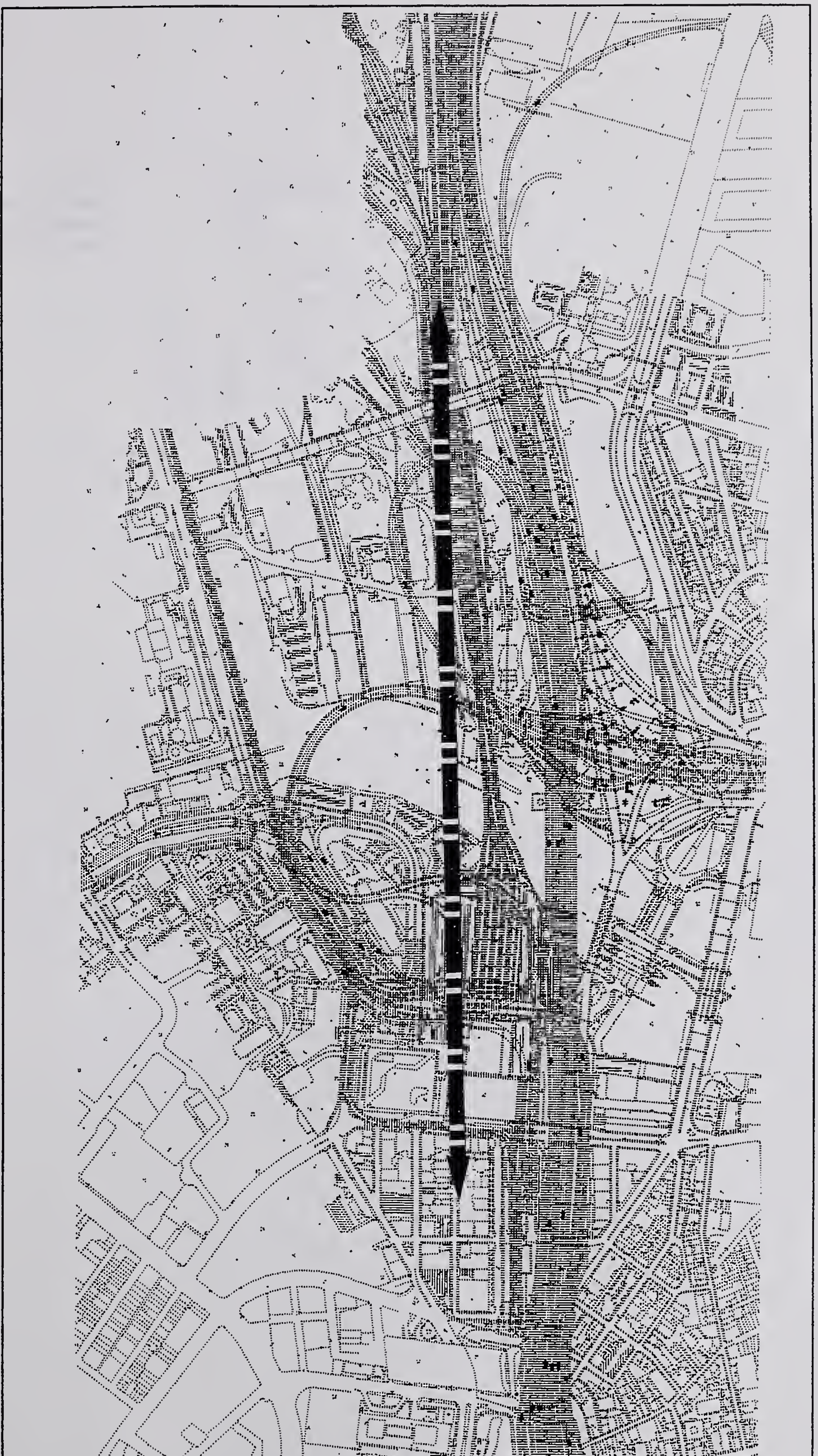

Figure 3.3

North Station to South Station Commuter Rail Link Potential Location. Revised Charles River Crossing.

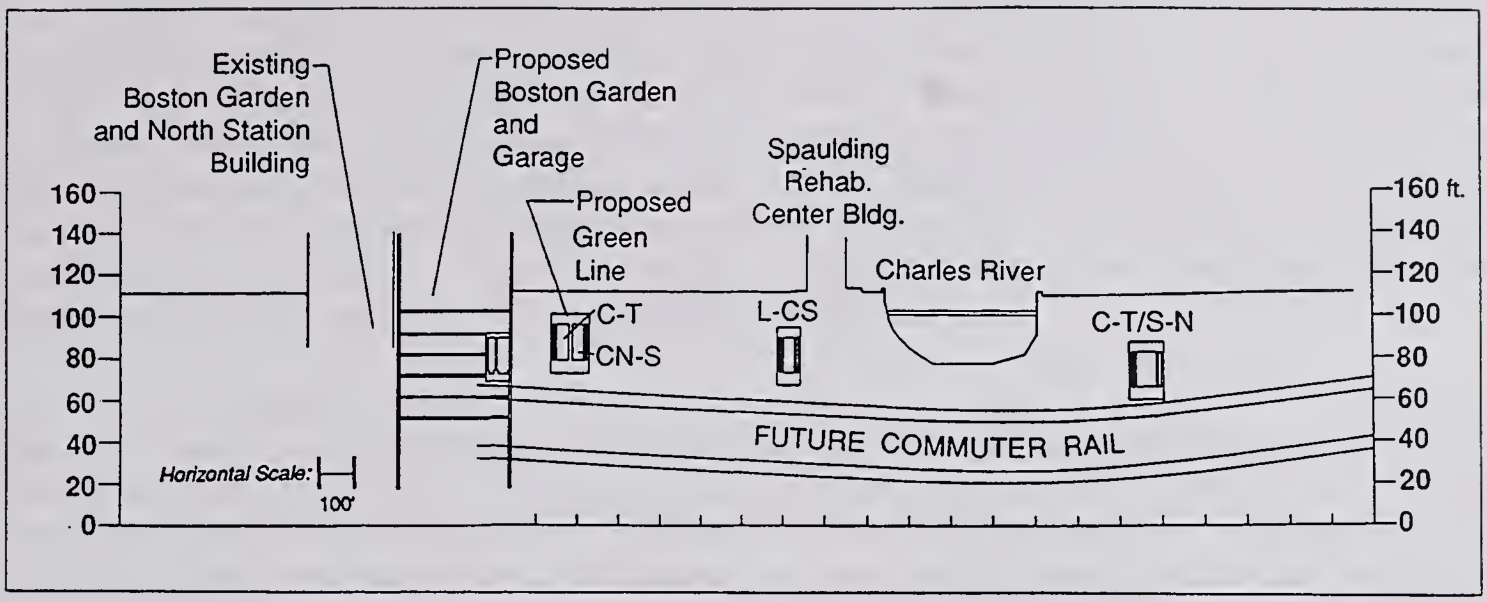

Figure 3.4

North Station to South Station Commuter Rail Link Profile. Revised Charles River Crossing.

3.2.1(b) Regional Emissions

An evaluation of areawide emissions gives an indication of the total pollutants emitted on the study area and their effects in the formation of ozone. In terms of total areawide emissions, a comparison of VMT could be used as an indicator (assuming similar average vehicle speeds and delays). This design change in the Revised Charles River Crossing will result in a total roadway reduction of VMT for the entire Artery/Tunnel Project area by approximately 2 percent, mainly due to the elimination of the double river crossings and addition of the new northbound ramps. These reductions are even higher for the localized Charles River area. Accordingly, a reduction in overall areawide emissions could be expected. A specific quantification of the changes in areawide emissions for CO, hydrocarbons, nitrogen oxides, and particulate matter will be performed during subsequent analyses.

3.2.1(c) Ventilation Building

The ventilation system for these new tunnels will require one new ventilation building. The purpose of the ventilation system will be to provide for acceptable in-tunnel air quality levels during normal operating conditions in order to protect the health of motorists and to control smoke and heat in case of in-tunnel fires. This ventilation building will exhaust air for all of the tunnels for the Revised Charles River Crossing. An advantageous site for this structure would be on the south side of the Charles River to the north of the new Boston Garden site.

Recommendations regarding the specific locations, design, and operation of the ventilation building will take into consideration that their pollutant release must comply with the National Ambient Air Quality Standards (NAAQS) and the Massachusetts Department of Environmental Protection (DEP) policy guidelines for nitrogen dioxide (NO_2). The six ventilation buildings already planned for the remainder of the project, included in the FSEIS/R, are in compliance with both the NAAQS and DEP guidelines. The new ventilation buildings will be designed to meet the same air quality requirements.

Due to the complexity of the surrounding area, which includes existing and proposed large-scale developments, both analytical and physical modeling (wind tunnel testing) will have to be performed and documented during the design of the Revised Charles River Crossing and any supplemental environmental in order to verify that the ventilation buildings will comply with the Federal and State requirements.

3.3 Noise And Vibration

This section describes the noise and vibration impacts of the Revised Charles River Crossing. Noise and vibration impacts were assessed at 15 sensitive receptors representative of each category of land use in the Area North of Causeway Street (see Table 3.6 and Figures 3.5 and 3.6).

The approach used in this qualitative noise assessment for the Revised Charles River Crossing is based on the assumption that noise levels are generally proportional to traffic volumes on at-grade roadways, boat sections, tunnel portal areas, and viaducts, and that vehicle speeds on these roadways do not differ significantly between the FSEIS/R Proposed Action and the Revised Charles River Crossing. Based on "worst-case" assumptions, the assessment is deemed to be conservative. More detailed analysis using traffic information and STAMINA 2.0 highway traffic noise model will be undertaken to estimate precisely the traffic noise impacts at the sensitive sites.

3.3.1 Traffic Noise Levels

Noise analysis in the FSEIS/R for the Proposed Action in the Area North of Causeway Street revealed that 2010 predicted exterior noise levels at all 15 receptor locations would exceed the FHWA Noise Abatement Criterion (NAC) of 67 A-weighted decibels (dBA). The future high noise levels are due to large volumes of traffic on roadways and viaducts associated with the FSEIS/R Proposed Action and other roadways in the Area North of Causeway Street.

In the present qualitative analysis for the Revised Charles River Crossing the same 15 sites were reevaluated and are compared against the FSEIS/R Proposed Action noise levels. The analysis for the Revised Charles River Crossing shows that 13 out of the 15 sites would exceed the FHWA criterion. The existing noise levels currently exceed FHWA criterion at the same 13 locations. Future baseline noise levels without the Revised Charles River Crossing would also exceed the FHWA criterion at the same 13 receptor locations.

Of the 15 sites assessed five sites were estimated to have no change, six sites would project decreases in noise levels of 1 to 3 dBA, and four sites would register increases of 1 to 3 dBA. Thirteen sites would register levels higher than 67 dBA; at these same 13 sites the existing levels exceed the criteria level of 67 dBA. Details are given below.

- There would be no change in noise levels at five sites (sites 17, 18, 29B, 45, and 46).
- As receptor site 29A at Leverett Circle will be adjacent to at-grade roadway sections, this site would register an increase in noise level of up to 3 dBA which would be just perceptible.
- Since the Charles River Building (site 27) receptor site will be near a boat section under the Revised Charles River Crossing, this site would experience a generally imperceptible increase in noise level of 1 to 2 dBA.
- Paul Revere Landing Park on the south bank (site 28) will be closer to a viaduct and hence may register an insignificant increase of 1 dBA in noise level.
- Bunker Hill Community College (site 47) will be exposed to at-grade sections of roadways and ramps and hence would experience increases in noise levels of 1 to 2 dBA, which would be imperceptible.
- Charles River bank sites west of MBTA Commuter Rail railroad tracks (sites 39, 43, and 44) will experience noticeable reduction in noise levels due to reduction in size of the bridge structure over the Charles River and in the size and total number of viaduct structures in the east Cambridge area. Sites 39 and 43 would show no impact and would satisfy the FHWA NAC of 67 dBA.
- Charles River bank sites adjoining pedestrian walkways on the north and south banks of the Charles River (sites 40, 41, and 42) would also be quieter by up to 3 dBA.

3.3.2 Ventilation Building Noise Levels

One ventilation building will be required for the Revised Charles River Crossing, and it will be designed to meet the project design criteria. The project design criteria developed for exterior noise levels caused by ventilation buildings and associated equipment are consistent with the City of Boston Code, Ordinance, Title 7, Section 50. The limits are 50 dBA during the nighttime and 60 dBA during the daytime at the property lines of the nearest residences, and 70 dBA at all times for industrial areas. The project design criteria also comply with DEP guidelines that a facility should not increase the broad band noise level by more than 10 dBA above the existing ambient level, and that noise with a pure tone component shall not exceed ambient level by 5 dBA or more. The DEP guidelines apply to locations at the property line

Table 3.6

SITE DESCRIPTION TABLE OF NOISE RECEPTOR LOCATIONS

Site Number	Site Description
17	Edward Everett House (Harvard St., Charlestown; approx. 130 ft. from c/l New Rutherford Avenue
18	Paul Revere Landing Park, north Bank (approx. 300 ft. from c/l Charlestown bridge)
19	Charles River Landing
28	Paul Revere Landing Park (south bank), riverside picnic area near MDC Police patrol boats
29A	Leverett Circle (Riverside)
29B	Leverett Circle (Charles River Park Side)
39	GSA Site, Cambridge
40	Walkways Adjoining MBTA Commuter Rail Bridge
41	Site on Charles River north bank
42	South bank walkway near Paul Revere Landing Park
43	Nashua Street Parcel/Spaulding deck
44	Site of pedestrian bridge over track
45	Charlestown Courthouse (City Square)
46	Along New Rutherford Ave. (Residences)
47	Bunker Hill Community College

Source: Bechtel/Parsons Brinckerhoff

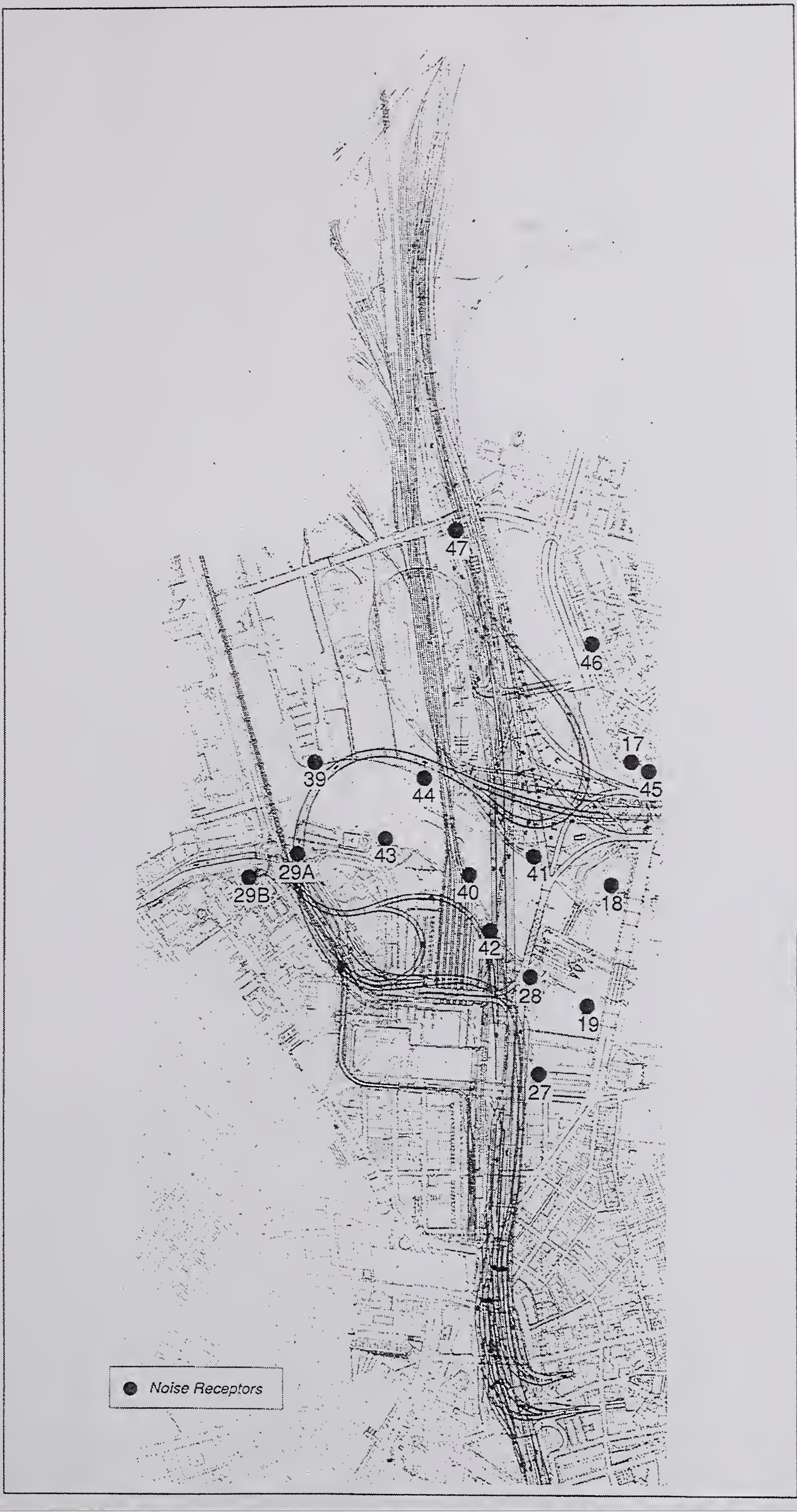

Figure 3.5

Location of Sensitive Noise Receptors.
Revised Charles River Crossing.

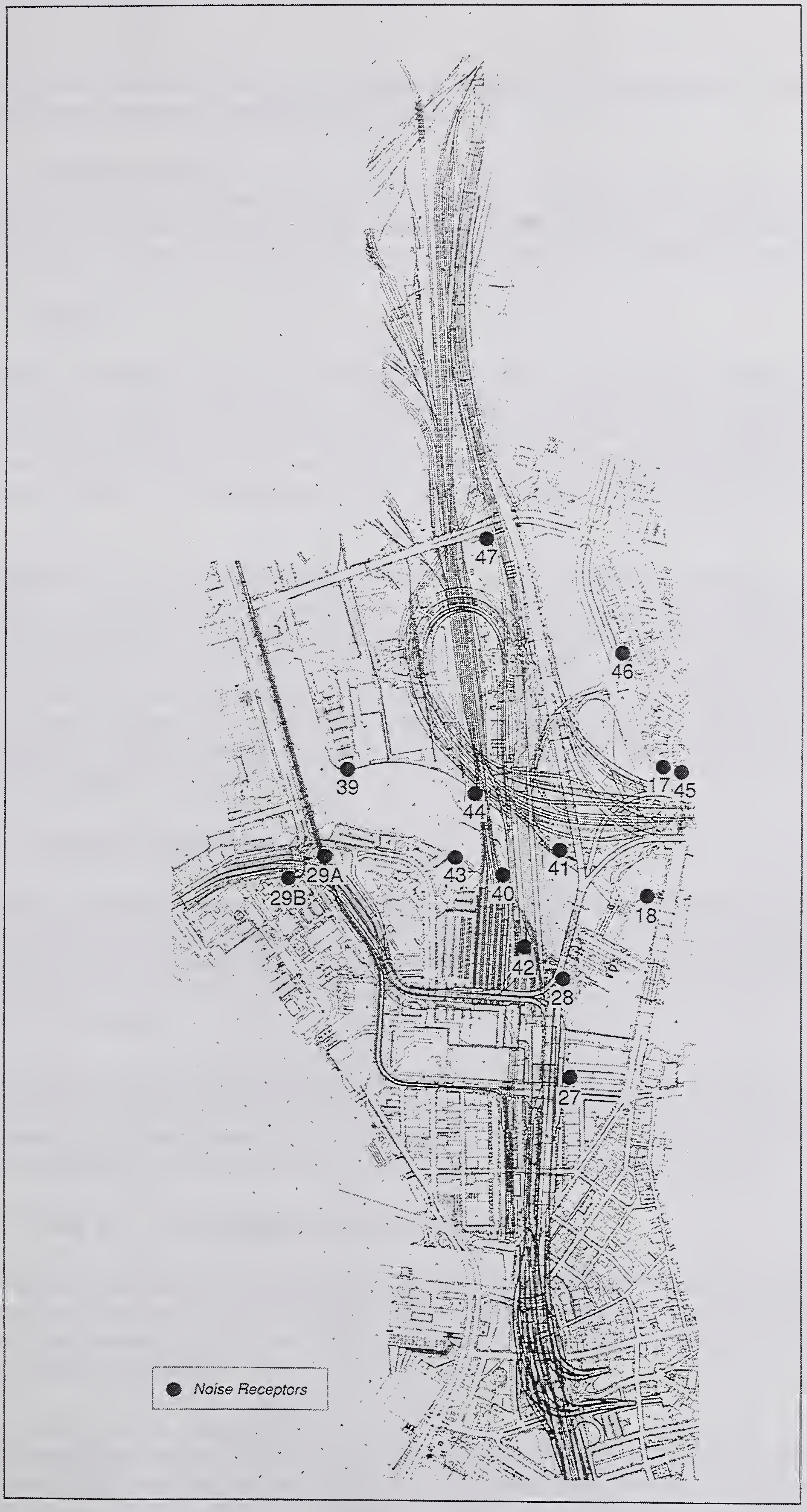

Figure 3.6

Location of Sensitive Noise Receptors.
FSEIS/R Proposed Action.

as well as at the nearest inhabited residences. Mitigation measures will be incorporated in the ventilation building design, where required to meet the project criteria.

3.3.3 Mitigation Measures

Noise mitigation will be studied in detail as part of the design and mitigation implementation process for the Charles River and for the Charlestown neighborhood. Under the Revised Charles River Crossing impacts and mitigation measures will be similar to those incorporated into the FSEIS/R Proposed Action.

3.4 Energy

It is estimated that the changes in the Area North of Causeway Street will result in a 2 percent reduction in overall VMT. This change will result in a parallel reduction in direct energy expenditures (fuel consumed) by vehicles operating in the study area. Based on the annual fuel consumption estimate contained in the FSEIS/R Proposed Action, it is estimated that the changes in the Area North of Causeway Street will result in an annual fuel savings of approximately 50,000 equivalent barrels of oil (bbl).

The design modifications for the Area North of Causeway Street include the construction of landside tunnels, as well as a tunnel under the Charles River. These tunnel structures will require ventilation, lighting, and drainage systems. The energy requirements to operate these systems will offset some of the savings derived from reduced VMT described above. Energy requirements for these tunnel maintenance systems have not been calculated, but would be well below the 50,100 bbl annual figure presented for all tunnels included in the FSEIS/R. Therefore, the changes in the Area North of Causeway Street will result in an overall, long-term reduction in energy consumption when compared to the FSEIS/R Proposed Action.

3.5 Economic Characteristics

Since the analysis of economic impacts was conducted on a projectwide basis, changing the design of one segment of the project will not substantially change the overall calculation of long-term project benefits. In addition, any local design changes will be insignificant to overall project benefits in light of longer-term economic trends and cycles which have occurred since these sections were written (Fall 1990) and which will occur in the future.

All of the long-term economic impact analyses completed for the FSEIS/R were conducted on a macro level. The analyses were performed using an economic simulation model developed by Regional Economic Models, Inc. Benefits were calculated for the State, the metropolitan area (the five-county New England Consolidated Metropolitan Area), and for the project area (Suffolk County).

3.6 Land Use And Neighborhood Characteristics

Existing land use and neighborhood characteristics in the Area North of Causeway Street will be virtually unchanged from that described in the FSEIS/R. Future land use and neighborhood characteristics conditions have the potential to improve significantly with the Revised Charles River Crossing as described in the following sections.

3.6.1 North Of The Charles River

North of the Charles River, effects of the Revised Charles River Crossing will be much less than those described for the FSEIS/R Proposed Action, due to the considerable reduction in the overall mass of the viaduct structure and supporting columns. The highway structure in the Revised Charles River Crossing will be located farther from both the residential community on the east side of New Rutherford Avenue in Charlestown and proposed future developments in Cambridge. In addition, the amount of land available for open space along the Charles River will be greater than that described for the FSEIS/R Proposed Action (see Section 3.8, Parklands), providing the opportunity for the MDC to implement their open space and park Master Plan, adding increased benefits for the community.

The I-93 northbound off-ramp to New Rutherford Avenue (Ramp C-L) will affect some of the recreational open space along the northern boundary of Bunker Hill Community College.

Boston Sand & Gravel Company will have to reconfigure some of its operations to accommodate highway structures, although the number and mass of overhead viaduct structures and columns will be reduced from that described in the FSEIS/R Proposed Action. Boston Sand & Gravel trucks will have greatly improved access directly between New Rutherford Avenue and the regional highway system due to a new at-grade signalized intersection. As a result, concrete trucks headed to and from the north will no longer need to use local streets in City Square, thus benefiting the community. Trucks will continue to use New Rutherford Avenue for a short distance to access I-93 southbound.

A large parcel between the I-93 viaduct, New Rutherford Avenue, and the new local access road perpendicular to New Rutherford Avenue and connecting to Ramps T-N and N-T will become available for a variety of potential uses. With the FSEIS/R Proposed Action, the unused parcel in this area is much smaller, is to be fenced, and functions only as highway infield.

3.6.2 South Of The Charles River

On the south bank of the Charles River, the Revised Charles River Crossing will affect several development parcels. Ramp CN-S will complicate the structural grid designated for the air rights garage of the MBTA Commuter Rail railroad tracks behind the new Boston Garden. This ramps may also affect the timing of potential developments on this site. Several ramps will be built in the MGH development parcel (presently used as at-grade parking). A new ventilation building will also be located in this parcel. The location of the ventilation building and the potential disruption and complicated sequencing during construction will require the acquisition of this parcel and the Spaulding Rehabilitation Hospital parcel. This will allow the MDC an expanded opportunity to implement its open space and parkland Master Plan between the Charles River Esplanade and the Lower Charles River Basin along the south bank of the river.

Replacement options are under discussion with the Boston Thermal Energy Corporation for the Minot Station steam plant at Nashua Street. The Registry of Motor Vehicles building need not be taken, but will be underpinned to allow a tunnel (Ramps S-CS) to pass beneath it.

3.6.3 Right-Of-Way

Property rights required include partial and full permanent takings of overhead permanent highway easements and temporary construction easements. Alignment changes associated with the Revised Charles River Crossing will lead to slightly increased takings and easements; comparisons with the FSEIS/R Proposed Action are shown in the following table.

	***Revised Charles River Crossing**	**FSEIS/R Proposed Action**
Number of Permanent Partial Takings	28 parcels	24 parcels
Number of Permanent Full Takings	11 parcels	3 parcels
Total Parcels Affected by Permanent Takings	**39 parcels**	**27 parcels**
Total Area of Permanent Takings	**870,199 sf**	**777,581 sf**
Total Area of Temporary Construction Easements	**30,000 sf**	**59,850 sf**

The asterisk (*) denotes that these takings do not include the easements for the CANA connections acquired in 1986 nor land necessary for the surface street intersections to be located northerly of the O'Neill Federal office building.

Property owned by the Commonwealth of Massachusetts and the City of Boston, and bodies of water, are not listed above.

3.7 Visual Characteristics

The existing visual environment is virtually unchanged from that described in the FSEIS/R Proposed Action. The following sections describe the permanent visual impacts of the Revised Charles River Crossing. The major advantage of the Revised Charles River Crossing will be the sense of continuity along the Charles River Basin. This continuity will be created by removing Spaulding Rehabilitation Hospital from the south bank of the Charles River, removing nearby bridge piers from the water surface, reducing the number of multiple loop ramps on the north bank of the river in east Cambridge/Charlestown, and reducing the number of mainline bridges over the Charles River from 3 to 1. The reduction in the number of ramps, piers, and bridges in the Revised Charles River Crossing will, in effect, reduce the mass of the structure. In contrast, the FSEIS/R Proposed Action dominates the Charles River Esplanade extension. It will compliment the existing bridges and dams and, in fact, add a new element and landmark to the "lost half-mile of the Charles".

3.7.1 North Of The Charles River

The visual experience of driving within the loop ramp system and on I-93 north of the Charles River will be very different in the Revised Charles River Crossing. In the FSEIS/R Proposed Action, the driver is confronted with a multiplicity of viaduct structures and is often driving on one segment of the mainline or ramp system surrounded by other segments of the system. The driver is flanked by traffic on other ramps moving in both directions; in several conditions, there are ramps above and below as well as flanking the driver. This complex geometry, with its attendant piers, columns, signs, and lights is disorienting and discomforting for the driver. In contrast, the Revised Charles River Crossing will remove much of the viaduct structure and simplify the I-93 mainline and loop ramp system to a degree that will permit the driver to navigate the interchange with a greater sense of certainty.

The effect of the reduction in scale and in the number of piers of the Charles River bridge is described in the Parklands section (see Section 3.8). Figures S.1 through S.4 illustrate the visual change from three separate bridge structures and their array of pier supports to the simplified and graceful form of one cable-stayed bridge. In contrast to the visual disorder of a double-decked bridge with a relatively flat horizontal geometry juxtaposed against two cable-stayed bridges with sloping vertical geometry, the single bridge will be an elegant expression of long-span engineering technology befitting this section of the Charles River Basin, which has historically been characterized by visually compelling viaducts, dams, and bridges.

In the east Cambridge area, a single viaduct structure (Ramp T-C) will replace the multitude of loop ramps in the FSEIS/R Proposed Action. The varying horizontal geometry of the earlier ramps combined with the many piers and bent supports creates a visual barrier, a screen wall between Charlestown and Cambridge. The single ramp supported by slender piers will replace this barrier with a simple graceful geometric form. The greater setback of this remaining loop ramp where it passes under the Charles River bridge will improve the visual continuity of the open space system and the pedestrian walkway.

The Revised Charles River Crossing I-93 mainline will be substantially reduced in width and height, permitting a column layout which will reduce the visual mass of the structure. This support structure can be aligned to minimize the visual impact from any direction and to permit views through the structure between Cambridge and Charlestown.

A series of ramp changes will improve the visual character of Paul Revere Landing Park north and the two New Rutherford Avenue parcels. A smaller, more compact highway infield will be created by moving the I-93 northbound off-ramp to New Rutherford Avenue (Ramp C-L) from City Square to the north and placing the Storrow Drive eastbound to Route 1 northbound movement (Ramp S-N) in a tunnel under New Rutherford Avenue parcels. These realignments will lessen the visual impact of connecting ramp viaducts, boat sections, and retained fill sections on the Charlestown community, the expanded Charles River Esplanade, and the area adjacent to Paul Revere Landing Park north.

3.7.2 South Of The Charles River

The Revised Charles River Crossing will be visually better than the FSEIS/R Proposed Action in and around Paul Revere Landing Park south. Since a one-level ramp will now be incorporated into a single cable-stayed bridge, it will be a less intrusive and more graceful structure than the former proposed double-decked bridge. In addition, moving the southern cable-stayed bridge abutment farther from the river will accomplish two goals: the pedestrian pathway along the river's edge will be more clearly perceived as a continuous walkway; and the design of the cable-stayed bridge will clear the river's edge and meet the ground in a more graceful manner than the multiple bridges of the FSEIS/R Proposed Action.

At Leverett Circle, the revised surface street plan will modify the space under and contiguous to the MBTA Science Park station. In the FSEIS/R Proposed Action there is a landscaped parcel, a discernable and identifiable "circle". The Revised Charles River Crossing will allow the opportunity to landscape the median between Storrow Drive eastbound and westbound as well as other traffic islands created by the at-grade intersection.

Removal of Spaulding Rehabilitation Hospital will create an opportunity to promote visual continuity along the expanded Charles River Esplanade's south bank. This will allow a visual link between the Nashua Street parcel and Paul Revere Landing Park south. Currently (and in the FSEIS/R Proposed Action) this continuity is precluded along the water's edge by the mass and height of the Spaulding Rehabilitation Hospital, which acts as a visual barrier.

A ventilation building, 60 to 80 feet in height, will be set back a minimum of 100 feet from the river's edge. The stack height and building massing will be determined during DEP certification process. The building's design will be compatible with the industrial character of the bridges, dams, and viaducts crossing the river.

3.8 Parklands

The design features of the Revised Charles River Crossing will include a narrower bridge over the Charles River and fewer piers and columns in the water and banks, respectively. These features will greatly enhance the opportunity for the MDC to expand the MDC parkland on both sides of the river. The relocation of Spaulding Rehabilitation Hospital will remove one of the major constricting elements of pedestrian access and visual continuity between the Charles River Esplanade and the Lower Charles River Basin. The relocation of this building will greatly change the visual environment of this entire section of the Charles River. This area will be available for to the MDC for open space or the future development of parkland, all of which will improve the lower Charles River Basin.

The 1990 FSEIS/R notes that the MDC has long had a goal to extend the Esplanade on the north and south banks of the Charles River to connect it through the area between the old and new Charles River dams to the open spaces along the edge of Boston Harbor. The Area North of Causeway Street contains a number of existing and proposed open spaces along and near the Charles River, including the portion of the river surface between the old dam and the railroad bridge, which was designated by the MDC as a recreation area.

Over the past decades, the open space plans for the area have been advanced by the MDC's program of acquisition and development of land, and by conditions to the Massachusetts Chapter 91 licenses for the Department's CANA project, the construction of the new Suffolk County Jail on Nashua Street, and the reconstruction of the MBTA railroad trestle and bridge. Most recently, the MDC has begun final master planning and design of the open space system between the dams with assistance from the project's mitigation package.

In accordance with Section 4(f) of the Department of Transportation Act of 1966, no Federal action may use land from a significantly owned park, etc., unless there is no feasible and prudent alternative; and, the action includes all possible planning to minimize harm to the property resulting from such use. The Revised Charles River Crossing will include all possible planning to minimize harm to these properties during construction activities. It is anticipated that this design will add significantly to the 4(f) parkland in this area of the project.

The following sections address changes in impacts to parklands and open space in the Area North of Causeway Street in the same sequence as in the FSEIS/R. These changes may be best understood in terms of the overall parkland system envisioned in the MDC plans for the area. Four major open space areas (Paul Revere Landing Park north and south bank parcels, the former GSA parcel, and the Nashua Street parcel) provide focal areas of activity, while continuous paths on both sides of the Charles River will connect these areas with each other and with the larger system of the Charles River Esplanade and Boston Harborwalk. Changes in impact with the Revised Charles River Crossing are favorable due generally to (1) reduced visual impact (and, potentially, noise impact) on the major open space activity areas, (2) availability of wider open space along the riverbanks, and (3) reduced impediment to continuity of the open space system along the river.

3.8.1 North Of The Charles River

Former GSA Parcel. This major activity area will be improved in the Revised Charles River Crossing by reduced visual and, potentially, noise impacts. Its use may be increased as more pedestrians travel along the north bank between the GSA parcel and the north bank portion of Paul Revere Landing Park, because of downstream improvements including wider parkland, reduced impacts of ramp and bridge columns, narrower shaded area, and improved bridge aesthetics.

North Point Waterfront. This area is currently in private ownership but is planned for public acquisition and open space development. Its open space potential will be improved in a similar manner to that of the GSA parcel. Reduction of loop ramps to a single ramp in the Revised Charles River Crossing will be a major reduction in impact. In addition, there are preliminary plans for the creation of new water body by landscaping and reshaping the excavation to be used as a graving basin during construction of the Revised Charles River Crossing. This feature would be little affected by the single remaining loop ramp and would provide a significant park amenity.

CANA Area West Of MBTA Commuter Rail Tracks. This area, owned by the Department for highway construction, will be subsequently landscaped. It provides an important link in the north bank pedestrian system, including a pedestrian overpass of the MBTA Commuter Rail railroad tracks. In the Revised Charles River Crossing, it will be widened from 45 to 180 feet, thereby greatly increasing its potential. The success of this key connection will be improved substantially by the removal of massive overhead ramps, dense inner loop ramps and their columns, and the double-decked bridge, which are present in the FSEIS/R Proposed Action.

CANA Area East Of MBTA Commuter Rail Tracks. This area is the intersection of transportation and open space corridors. In the FSEIS/R Proposed Action, its function in the continuity of the north bank pedestrian system is adversely affected by the presence of overhead ramps and bridge decks which cover a 430-foot length of riverbank, and by the dense system of loop ramps and supporting columns which extends to the riverbank. In the Revised Charles River Crossing, the available open space will be widened to 215 feet and shaded area will be reduced to 220 linear feet of riverbank. Reduction in bridge structures to one pier for the northern bridge tower on and near the north bank will open views along and across the river. Together, these improvements will increase the usability of this area and permit better design of the pedestrian overpass of the MBTA commuter railroad tracks. The southern end of the Millers River will be a contributing feature to this open space.

Millers River And Connections To New Rutherford Avenue. The Millers River area is adversely affected by overhead structures and supporting columns in the FSEIS/R Proposed Action. These overhead impacts will be largely reduced in the Revised Charles River Crossing and the south end of the Millers River will contribute to widened open space along the Charles River. A surface roadway intersection will limit the open space potential of the Millers River area north of the remaining loop ramp crossing. Many of the open space functions envisioned for the Millers River but not realized in the designs for either the CANA project or the FSEIS/R Proposed Action can be expanded by the potential new water body upstream of the railroad crossing. This water body could be created in the graving basin for tunnel construction. Physical access to the Charles River open space system from New Rutherford Avenue would still be possible in this area, and it could be improved in security by the presence of surface streets as opposed to the high-speed highway ramps of the CANA project and the FSEIS/R Proposed Action.

Paul Revere Landing Park, North Bank Portion. This major park area will be expanded to a greater degree in the Revised Charles River Crossing by the elimination of the Central Artery off-ramp to City Square. The closest ramp in the Revised Charles River Crossing will be 110 feet farther from the river's edge and is a boat section, which helps to reduce both visual and noise impacts of vehicles adjacent to the park as compared to the closer surface ramp in the FSEIS/R Proposed Action. The narrowing and improved bridge aesthetics will be major benefits to Paul Revere Landing Park's north bank portion.

3.8.2 South Of The Charles River

Charles River Esplanade/Leverett Circle. Impacts will be essentially unchanged from the FSEIS/R Proposed Action. No land from the Esplanade will be used on a permanent basis, and traffic volumes on Storrow Drive will be essentially the same as in the FSEIS/R Proposed Action on a permanent basis. The removal of the Spaulding Rehabilitation Hospital will enhance the visual continuity between the Charles River Esplanade and the lower Charles River Basin, thereby creating high-value open space along the banks of the Charles River.

Nashua Street Parcel/Spaulding Walkway/MBTA Upstream Walkway. This parkland and connecting walkways are adversely affected by visual and noise impacts of the FSEIS/R Proposed Action's massive loop ramp system (450 feet away and directly facing the parkland) and double-decked bridge (immediately downstream). In the Revised Charles River Crossing, the loop ramps will be reduced to one, which will be 25 feet high rather than 105 feet, and will be 135 feet farther from the river. The double-decked bridge will be removed, and the river crossing will be a located 110 feet farther downstream. In addition, the removal of the Spaulding Rehabilitation Hospital will improve the desirability of the Nashua Street parcel and better visually connect it with other parkland downstream along the river. More land will be added to this park parcel near Leverett Circle and the removal of the Spaulding Rehabilitation Hospital will make an additional parcel available for open space. A ventilation building located well south of Nashua Street will not adversely affect this area.

MBTA Downstream Walkway And Backland. A second MBTA walkway is located on the downstream side of the railroad bridge. This area is important primarily as a link in the riverfront path system and as a place of future pedestrian connections alongside the railroad bridge, in air rights over the MBTA tracks. The potential for appropriate design of these path connections will be improved by removal of the double-decked bridge which is directly overhead in the 1990 FSEIS/R Proposed Action. The Revised Charles River Crossing will open up this portion of riverbank and will provide better views along and across the river, and better aesthetics in the redesigned bridge crossing, which may help to encourage use of this portion of the open space system. A boat section 100 feet back from the river may reduce the quality of secondary access to this area and its path connections from Causeway and Canal Streets. The important air rights connection from this parcel over the MBTA platform will be substantially enhanced by the development of open space on the Spaulding Rehabilitation Hospital site at the upstream end of the pedestrian connection.

Paul Revere Landing Park, South Bank Portion. The redesigned bridge in the Revised Charles River Crossing will be narrower and its abutment farther from the river than the FSEIS/R Proposed Action's mainline bridges. Land takings will be reduced by approximately 0.12 acre, and the width of the park at its narrowest point will be increased by approximately 20 feet to 78 feet, measured from the top of the riverbank near Lovejoy Wharf. The usable park area, its ambience, and visual continuity with the park system will all be improved. The reduction in bridge piers in the Charles River (from eleven to one) will improve views.

Connection To Causeway Street. The area between Causeway Street and Paul Revere Landing Park is a major entrance to the Charles River open space system. It is improved by both the FSEIS/R Proposed Action and the Revised Charles River Crossing. The Revised Charles River Crossing, however, will provide better bridge aesthetics and a wider cross-section at Paul Revere Landing Park, to which this area connects.

Lovejoy Wharf. This area is planned for improvement as a ferry terminal and entrance to the park system from the Charlestown bridge and, via underpass, from the North End park. Its setting will be improved by better bridge aesthetics.

Walkways On The New MDC Dam. Views from this important pedestrian crossing will be improved by better bridge aesthetics and by the reduction in the number of bridge piers (from eleven to one).

3.9 Historic Resources

Changes in long-term environmental impacts of the Revised Charles River Crossing on historic resources are described as follows (see Figures 3.7 and 3.8).

3.9.1 Tower A

While Tower A is not scheduled for demolition under the FSEIS/R Proposed Action, it is under the CANA project. As part of the Section 106 consultation process for the FSEIS/R, however, it was agreed that the Department would prepare Historic American Engineering Record (HAER) documentation of Tower A prior to demolition as part of the Artery/Tunnel Project. The Revised Charles River Crossing will remove the CANA project ramp impact, and will avoid demolition of this structure.

3.9.2 Charles River Basin District

The Charles River Basin National Register District is permanently affected under the FSEIS/R Proposed Action by the permanent move of the southeast curb line of Storrow Drive 20 feet southeast, resulting in a wider roadway. This was determined to have no adverse effect on the district. The Revised Charles River Crossing will have the same curb line as the FSEIS/R Proposed Action.

The FSEIS/R Proposed Action also affects the northeast terminus of Storrow Drive by removal of the traffic rotary at Leverett Circle and creation of a larger landscaped area. No long-term effects to the historic Street Railway Viaduct are anticipated. The Revised Charles River Crossing will also remove the traffic rotary at Leverett Circle. Appropriate design of the new Leverett Circle intersection to maintain the historic character of this corner of the Charles River Basin District will have a positive long-term effect on the district.

3.9.3 100 Nashua Street

The FSEIS/R Proposed Action has no long-term effects on this eight-story public office building at 100 Nashua Street. The Revised Charles River Crossing will have a potential effect on 100 Nashua Street because tunnels providing regional access to Route 1 northbound (Ramps L-N and L-CS) will pass under the Registry of Motor Vehicles building. The potential long-term effect on the building will be mitigated by underpinning during construction.

3.9.4 Causeway/North Washington Streets District

The FSEIS/R Proposed Action has no long-term effects on this district. The Revised Charles River Crossing will require a new ventilation building in the vicinity of North Station. The location and height of this structure is expected to be shielded by area buildings and open space and therefore reduce the effect on the Causeway/North Washington Streets District.

3.9.5 Charles River Railroad Draw 1

Neither the FSEIS/R Proposed Action nor the Revised Charles River Crossing would have long-term effects on Charles River Railroad Draw 1.

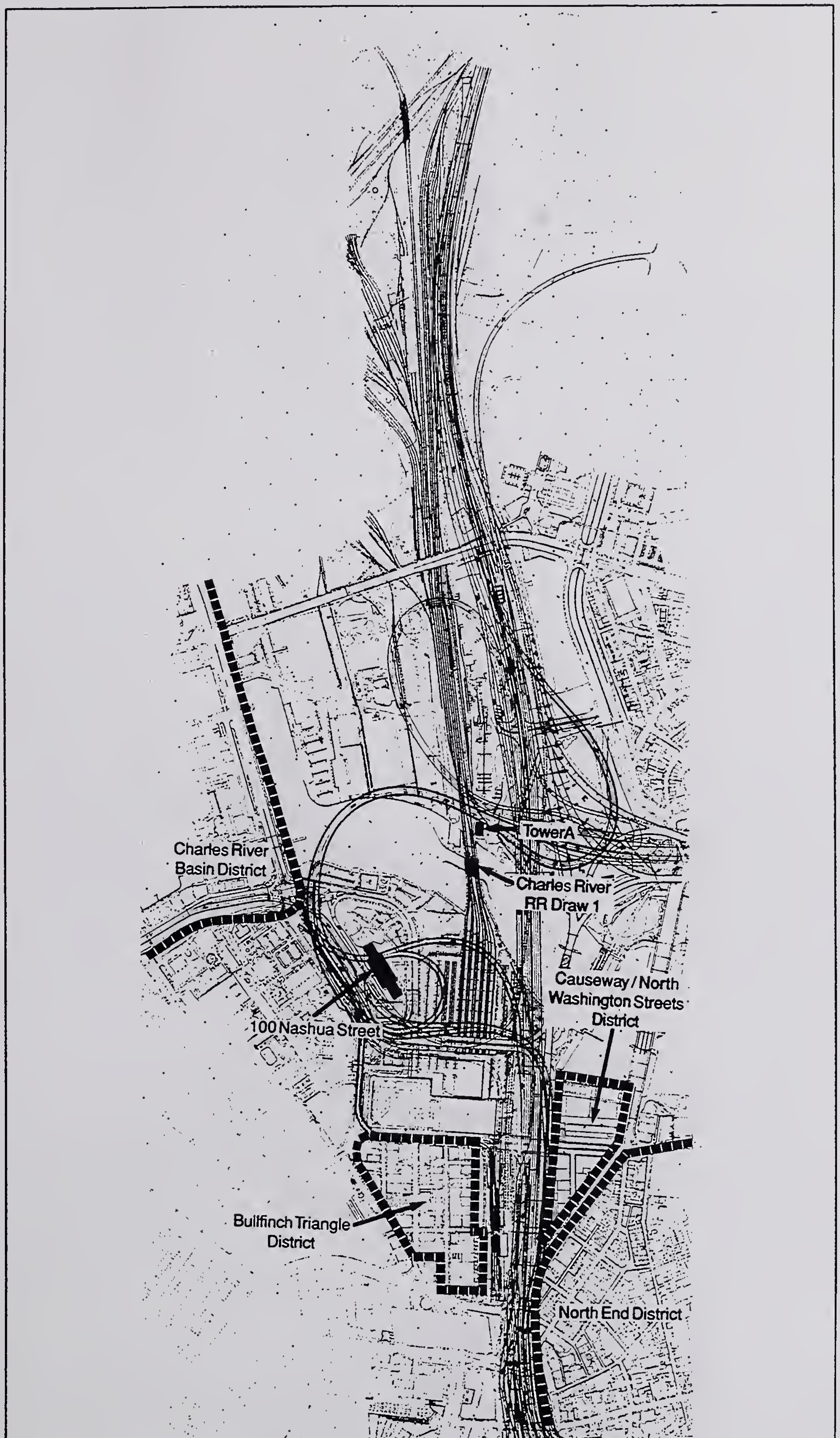
TowerA
Charles River Basin District
Charles River RR Draw 1
Causeway / North Washington Streets District
100 Nashua Street
Bullfinch Triangle District
North End District

Figure 3.7

Historic Resources
Revised Charles River Crossing.

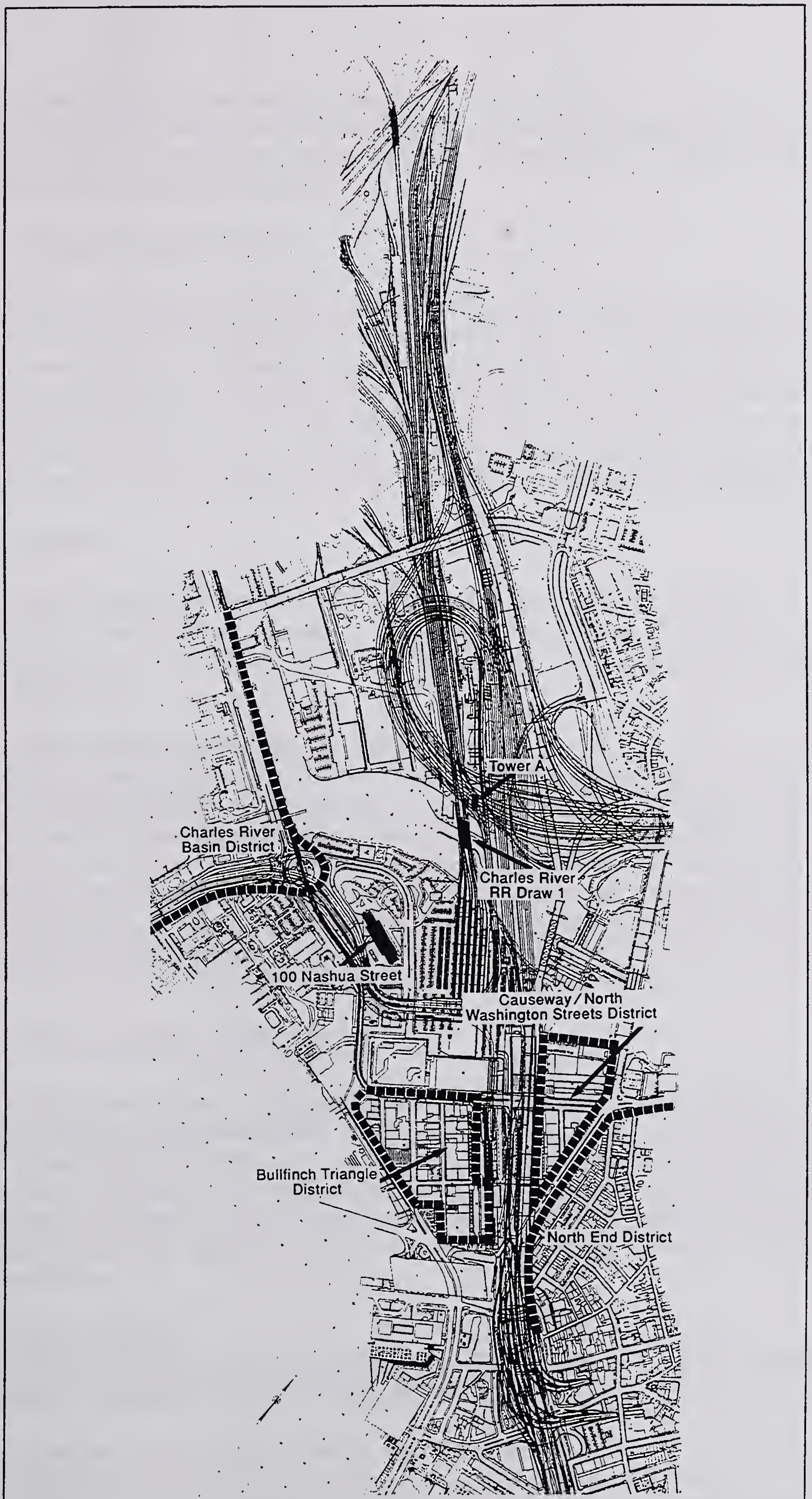
Tower A
Charles River Basin District
Charles River RR Draw 1
100 Nashua Street
Causeway / North Washington Streets District
Bullfinch Triangle District
North End District

Figure 3.8

Historic Resources
FSEIS/R Proposed Action.

3.9.6 Other Effects Due to Design Change

The Revised Charles River Crossing will relocate the I-93 northbound off-ramp (Ramp C-L) to New Rutherford Avenue further north beyond Bunker Hill Community College. There are no National Register Eligible historic properties in this area.

3.10 Archaeological Resources

The Phase I Archaeological Report on the Artery/Tunnel Project in Boston, Massachusetts (Boston University 1988), established that no significant archaeological resources existed between the Gilmore Bridge and Causeway Street in the Central Artery project alignment. The Revised Charles River Crossing is within the study area of this report, with the exception of the proposed I-93 northbound off-ramp to New Rutherford Avenue north of the Gilmore Bridge and land tunnels and the river tunnel which are to the west of the CANA study area. Although it is unlikely that this area will contain significant archaeological resources, it will be confirmed with the Massachusetts Historical Commission.

3.11 Utilities

3.11.1 Utility Relocations Required For The Revised Charles River Crossing

Table 3.7 identifies the major utilities affected by the Revised Charles River Crossing from Causeway Street to Storrow Drive and to the Gilmore Bridge in Charlestown. Additional or revised conflicts are indicated by an asterisk (*).

3.11.2 Boston Thermal Minot Station Displacement

The most significant utilities impact of the Revised Charles River Crossing will be the displacement of the Minot Station steam generating plant (adjacent to the Registry of Motor Vehicles building, 100 Nashua Street) owned by Boston Thermal Energy Corporation (BTEC). The FSEIS/R Proposed Action requires the relatively minor taking of only the icehouse annex of the building, and leaves intact the major portion of the building with its steam generating capacity. Replacement alternatives under discussion with BTEC include expansion of an existing steam generation plant at Kneeland Street or a location in the vicinity of the existing Nashua Street site. The Department will assist BTEC with filing a Comprehensive Plan of Approval with DEP, Division of Air Quality Control for the replacement.

3.12 Water Quality And Fisheries

The Revised Charles River Crossing will represent an opportunity to potentially improve otherwise degraded water resources in the Charles River Basin. For instance, oil and water separators may be installed to treat runoff from the MBTA rail lines and Boston Sand & Gravel Company prior to discharge into the Millers River. Presently, runoff discharges directly from these areas into the Millers River. In addition, stormwater runoff laden with salt from deicing agents will be discharged downstream of the Charles River Locks and Dams into Boston Harbor thereby avoiding direct discharge to the freshwater reach of the Charles River.

3.12.1 Water Quality

The FSEIS/R Proposed Action identifies the following project structures and work occurring in or adjacent to the Lower Charles River and the Millers River:

- three new bridges over the Charles and Millers Rivers
- ramps and a cloverleaf structure east of and above the Millers River
- demolition of the existing Central Artery bridge over the Charles River

Three new bridges are constructed over the Charles River west of the new dam, and the existing Charles River bridge demolished. Eleven piers are constructed in the Charles River to support the new bridges. A maximum of 13 piers are placed in the Millers River as part of the new I-93/Route 1 interchange structure.

The Revised Charles River Crossing will involve one bridge with one large pier in the Charles River (the west leg of the north tower). The Millers River will be partially filled, and the existing drainage will be discharged directly to the Charles River. The proposed drainage system will be designed to provide the net cross-sectional flow area which exists in the Millers River (two 84-inch culverts at its mouth).

Stormwater flow generated on the roadway facilities in the FSEIS/R Proposed Action does not cause a significant degradation of water quality, and tunnel washdown water is discharged to sanitary sewers for treatment. The Revised Charles River Crossing will generate less stormwater flow since more of the interchange is in tunnel. In addition, this stormwater will be discharged downstream of the new Charles River Locks and Dams into Boston Harbor to avoid direct discharge of salt-laden water into the freshwater reach of the Charles River. The tunnel washdown water will be discharged to sanitary sewers to provide for proper treatment before discharging to receiving waters. Thus, the Revised Charles River Crossing will have less impact on water quality than the FSEIS/R Proposed Action.

3.12.2 Fisheries

The Charles River has a warm water fishery and an anadromous fish run. Anadromous fish are those that migrate from the sea to fresh water to spawn, where their young may hatch and feed in high productivity waters before returning to the sea at the end of their first summer. Submerged parts of structures placed in the river can provide shelter or feeding habitat for most fish and typically improve the local fishery. Neither the Revised Charles River Crossing nor the FSEIS/R Proposed Action substantially affects the fish population of the Charles River Basin, nor preclude migration of fish to their spawning grounds.

Nevertheless, fewer impacts to the local fisheries will result from construction of the Revised Charles River Crossing compared to the FSEIS/R Proposed Action. These differences are related to substantially fewer bridge piers in the river and narrower width of bridge deck crossing.

A reduction in the number of piers will reduce the amount of submerged surface area covered and displaced by the bridge's support structure. This surface area provides substrate for attached algae, a food source for certain freshwater fish species. For the FSEIS/R Proposed Action, the composition of the local fish community is represented by a greater proportion of species that feed on attached algae (e.g., fresh water drum, white sucker, brown bullhead). Even though the support structure in the Revised Charles River Crossing will be reduced, the crossing will continue to provide habitat that is used by a variety of open water (pelagic) feeders including young-of-the-year herring and sunfish species (shad, bluegills, green sunfish, crappies). Bridge crossings typically provide deeper, shaded areas preferred by these species.

Anadromous species of shad, smelt, and alewife spawn in the Charles River. A report on the Connecticut River indicated that shade may affect migration behavior of American shad (Boyd Kynard, U.S. Fish and Wildlife Service). While this has never been scientifically verified, nor the extent of any effect assessed, the narrower crossing will cast less shade on the water, thus will be less likely to elicit any behavioral response.

Table 3.7

EXISTING UTILITY LINES AFFECTED BY THE REVISED CHARLES RIVER CROSSING

General Location	Type (Size)	Comments
Causeway Street to Charles River (Accolon Way)	*SD (36")	Overflow
	SS (10")	
	CS (36")	
	Electrical (4 ducts)	
	*HS (16" & 8")	
	LS (36")	
	Telephone (12 & 3 ducts)	
	Two CS (42")	
Leverett Circle	CS (24"x36")	Siphons
	Two CS (42")	West Side Int.
	CS (48")	
	HS (12", 6")	
	*LS (16", 12", 10", 8" & 6")	
	LS (10")	
	Electrical (24 ducts)	
	345 kV Electrical	
	*GS (8", 6" & 4")	
	*Telephone (24, 18 & 4 ducts)	
	AC (5 ducts)	MBTA
	*SD (54" & 24")	
	*SS (10")	
	*CS (2-84")	
	*CS (72"x90")	
	*CS (36"x54")	
	*115 kV Electrical (2-8.6")	
	*Electrical (12 & 4 ducts)	
River Crossing	*WU (6 ducts)	
	*AC (3 ducts)	MBTA
CANA Loops	*Telephone (3 ducts)	
	*LS (12", 8" & 6")	
	*GS (6" & 4")	
	*CS (96")	Force Main MWRA
	*CS (60")	
	*CS (24"x24")	
	*SD (84")	
	*SS (18")	
	*AC (4")	
	*Electrical (6 ducts)	
Rutherford Avenue	LS (36")	
	Water (8" & 6")	
	Electrical (12 ducts)	
	Telephone (3 ducts)	

Table 3.7 (Cont.)

EXISTING UTILITY LINES AFFECTED BY THE REVISED CHARLES RIVER CROSSING

Abbreviations:

CS	Combined Sewer
SS	Sanitary Sewer
SD	Storm Drain
LS	Low Service (Water)
HS	High Service (Water)
GS	Gas
AC	Alternating Current
WU	Western Union

* Additional or revised conflicts

Source: Bechtel/Parsons Brinckerhoff

3.13 Wetlands And Waterways

3.13.1 Wetlands

Impacts to State wetlands resource areas, as defined by the Wetlands Protection Act (M.G.L. Ch. 131, S. 40) Regulations (310 CMR 10.00), result from the installation of support footings and the erection of bridge support piers in and adjacent to the Charles and Millers Rivers. Impacts of the Revised Charles River Crossing are similar in nature to those of the FSEIS/R Proposed Action. There are three components in the design of the Revised Charles River Crossing, however, which are not part of the FSEIS/R Proposed Action, but will create additional impacts to wetlands resource areas. These components are (1) an immersed tube tunnel running in a northeasterly curve under the bottom of the Charles River from a point on the south bank of the river approximately midway between Leverett Circle and Suffolk County Jail to the waterfront section of eastern Cambridge; (2) a short crossing of the lower reach of the Millers River by two tunnels (Ramps S-N and C-T); and (3) surface roadways beneath the I-93 viaduct structure on the north side of the Charles River.

The surface streets, essential elements of the Revised Charles River Crossing, will connect New Rutherford Avenue with Ramps N-T and T-N and will provide greatly improved access to Boston Sand & Gravel. This access will require the permanent filling of a significant portion of the Millers River. Any associated impacts on wetlands functions, specifically flood storage and storm drainage, will be addressed and compensated for under the projectwide Wetlands and Waterways Mitigation Program.

While the Revised Charles River Crossing will result in the filling of a portion of the Millers River, a variance from the Wetlands Regulation (310 CMR 10.00) is not required because the Performance Standards for specific wetland resource areas can be met. As demonstrated in the 1990 SFEIR, the Millers River is not significant to the protection of fisheries and wildlife habitat, thus the numerical limitations of the Performance Standards pertaining to Land Under Water, Land Subject to Flooding, and Banks should not be applicable.

Portions of the Revised Charles River Crossing will be water-dependent uses and will qualify for limited project status under 10.53 (3)(1); therefore, the provisions of this section can be met.

Table 3.9 quantifies the permanent impacts of the Revised Charles River Crossing for each State category of wetland resource present in and adjacent to the Charles and Millers Rivers, and it compares these quantities to those of the FSEIS/R Proposed Action.

The Revised Charles River Crossing will reduce wetlands impacts in the Charles River and increase wetlands impacts in the Millers River. Replication of bordering vegetated wetlands, compensatory flood storage, and mitigation for impacts to Land Under Water and Vegetated Bank will be provided as necessary to meet the performance standards. The projectwide Wetlands and Waterways Mitigation Program will be the forum for determining the appropriate location and nature of any revised mitigation activities required that may be warranted by the Revised Charles River Crossing.

The Revised Charles River Crossing will result in activities in wetlands under Federal jurisdiction, as well. The environmental permit process will incorporate Highway Methodology which is aimed at coordinating the Section 404 Permit with the NEPA process, during the design of the Revised Charles River Crossing.

3.13.2 Waterways

The Charles River bridge component of the Revised Charles River Crossing will have a lesser impact on the tidelands along both banks of the Charles River. This is because the cable-stayed bridge over the river will be a narrower (±162 feet vs. 275 feet) bridge than the FSEIS/R Proposed Action.

The Revised Charles River Crossing will have less extensive impacts on the filled tidelands along the Charles River. By placing several of the ramps in this area which were to be built on viaducts in the FSEIS/R Proposed Action into tunnels, the Revised Charles River Crossing will promote much improved visual, land use, and open space environments on both banks. With fewer elevated ramps and associated support structures, the Revised Charles River Crossing will make available many acres of land for open space development, particularly on the north side of the Charles River.

Since tunnels will be essential elements in the design of the Revised Charles River Crossing (there are no tunnels for this crossing in the FSEIS/R Proposed Action), a ventilation building must be built to provide a constant source of clean air to the tunnels. This structure will occupy filled tidelands on the south side of the Charles River. The exhaust stacks of the building will be visible from several vantage points. Since it will be appurtenant to the tunnels, the ventilation building will be classified as a water-dependent use of filled tidelands.

The FSEIS/R noted that the Proposed Action affords the Department, in coordination with other public agencies and private interest groups, the opportunity to address issues of access to and along the Lower Charles River in a comprehensive manner through a public planning process. The Revised Charles River Crossing will afford the Department the same opportunity. (The public planning process is ongoing at this time. The planners are preparing a master plan for the Lower Basin based on the Revised Charles River Crossing.) The removal of extensive viaduct structures from the banks of the river will enhance the opportunity to achieve major open space improvements and functional pedestrian linkages to the riverfront in conjunction with this process.

Two design components of the Revised Charles River Crossing will maintain or improve the navigational characteristics of the Lower Charles River Basin: the river tunnel will be installed entirely below the mudline of the river; and the cable-stayed design of the mainline bridge, a key feature of the Revised Charles River Crossing, will require one large support pier (the west leg of the north tower), rather than the 11 piers beneath the entire length of the bridge in the FSEIS/R Proposed Action.

Upon completion of construction and restoration of the ground surface, the presence of the tunnels below filled tidelands on both banks of the Charles River will not inhibit the future development of the surface for recreational uses consistent with those currently being contemplated by the public planning process for the Lower Basin.

By filling a portion of the Millers River, the Revised Charles River Crossing will have greater impacts on areas subject to Chapter 91 jurisdiction (flowed tidelands). However, filling a part of the Millers River will enhance the opportunity to improve the open space along the banks of the adjacent Charles River in the area beneath the new Charles River bridge, and to facilitate pedestrian access to and along the north bank of the Charles. The surface roadways leading from New Rutherford Avenue to CANA will afford the Department the opportunity to develop better and safer access to the north bank of the Charles in this area. The design of the FSEIS/R Proposed Action includes 13 piers in the Millers River to support viaducts. These viaducts cause shadow effects on the waterway in the Millers River, similar to the Revised Charles River Crossing.

TABLE 3.8

COMPARISON OF FSEIS/R PROPOSED ACTION TO REVISED CHARLES RIVER CROSSING PERMANENT IMPACTS TO WETLANDS RESOURCE AREAS

Wetland Resource Category	Locus	Project Purpose	FSEIS/R Proposed Action	Revised Charles River Crossing
Banks	Millers	Piers	40 lf	0 lf
		Surface Roads	N/A	2200 lf
	Charles	Piers	10 lf	0 lf
Land Under Water	Millers	Piers	1496 sf	0 sf
		Surface Roads	N/A	60,000 sf
	Charles	Piers	3500 sf	700 sf
Bordering Vegetated Wetland	Millers	Piers	0	0 sf
		Surface Roads	N/A	200 sf
Bordering Land Subject to Flooding [1]	Millers	Piers	1231 cf	0 cf
		Surface Roads	N/A	50,000 cf
	Charles	Piers	1250 cf [2]	-250 cf [3]

N/A: Not Applicable

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[1] Included in Surface Road impact.

[2] Includes removal of 1,540 cf of existing I-93 piers from the Charles River.

[3] Includes surface area of Charles and Millers Rivers.

The design of the Charles River crossing (mainline) as a single cable-stayed bridge will reduce the number of piers in the Charles River from 11 in the Proposed Action to one pier in the Revised Charles River Crossing. A large pier will be the west leg of the north tower, and will be located in the river behind the existing bascule bridge fender line close to the north bank of the river. At the east leg of the tower side of the cable-stayed span a pier will be located on land approximately 60 feet inland from the northern bank of the river. The positioning of these two legs will improve visual access to and within the river as well as leaving a substantial swath along the north edge of the river which can be developed for improved pedestrian access and circulation.

The Revised Charles River Crossing will result in the construction of anchor abutments to the cable-stayed bridge on filled tidelands. In addition, a presently undetermined number of piers to support the bridge approaches/ramps will be placed within filled tidelands on either side of the Charles River.

Special Conditions of the Chapter 91 License for the CANA project will require the Department to landscape highway loop infield areas; to regrade existing fill and landscape along the banks of the Millers River; and to construct a pedestrian walkway and bridge over the MBTA railroad tracks. The Revised Charles River Crossing will permit the mitigation measures to be implemented, although the infield areas which are part of the Revised Charles River Crossing will be different in size, shape, and location from those of the FSEIS/R Proposed Action. The mitigation strategy for the effects of the Revised Charles River Crossing on previous mitigation commitments (CANA), and its other effects on the public's interest in tidelands, specifically the infield areas and the Millers River, are discussed in Section 6.5.

In the Revised Charles River Crossing, the number of elevated loop ramps adjacent to the riverfront section of eastern Cambridge will be reduced from six to one. The loop ramps are the most controversial feature of the FSEIS/R Proposed Action, and they were the genesis of a mitigation agreement between the Department, EOTC, EOEA, and the MDC. The elimination of most of the loop ramps in the Revised Charles River Crossing will greatly diminish this category of impacts.

The Revised Charles River Crossing will result in filling a portion of the Millers River. The Millers River, due to its degraded condition and non-navigability, has limited value for waterways interests. Nonetheless, mitigation measures appropriate to the impacts will be developed in the Chapter 91 license process.

Since the publication of the FSEIS/R in November 1990, the Department has established a Projectwide Wetlands and Waterways Mitigation Program which is designed to identify locations throughout the project area that are appropriate for wetlands and waterways mitigation and which meet local, State, and Federal requirements. This process will be used to identify the location and nature of any revisions to waterways mitigation activities that may be warranted by the Revised Charles River Crossing.

3.13.3 Navigation

The Revised Charles River Crossing will include construction of a three-lane tunnel under the river bottom and a 10-lane bridge over the river. Since the tunnel will be built under the river bottom there will be no long-term impacts. The cable-stayed design of the bridge will require the placement in the river of one large pier for the west leg of the north tower. Since the top of the footings will be located permanently below the mudline, only the pier will require permanent fendering. Above the mudline, the large pier could consist of a concrete structure that could be approximately 30 feet in diameter.

The design of the foundation supporting the west pier of the north tower will address the proximity of the pier to the navigation area and to the Orange Line tunnel. As the design is developed and refined, it will be reviewed with the MDC Marine Police, the U.S. Coast Guard (USCG), the U.S. Army Corps of Engineers (USACE), and other agencies concerned with marine safety and navigation. The design will include permanent fendering of the pier.

With only one pier structure in the water instead of eleven, the Revised Charles River Crossing will result in a considerable reduction in physical obstructions in the waterway. Visual obstructions will also be diminished by the reduction in the number of piers. Thus boater safety will be enhanced. Similarly, since the net total area of the bridge deck with the Revised Charles River Crossing will be significantly less than the FSEIS/R Proposed Action, there will be fewer light and shadow impacts from viaducts over the navigation area.

Since the Revised Charles River Crossing will result in the reduction in the number of structures in the waterway and the narrowing of the bridge structure as it traverses the waterway, the long-term impacts of this design will be more beneficial to navigation interests than the FSEIS/R Proposed Action.

3.14 Floodplains

The Revised Charles River Crossing will cause no significant difference in impact on floodplains compared to the FSEIS/R Proposed Action. The water level in the lower Charles River and in the Millers River is controlled by the Charles River dam downstream of the proposed crossing, and the small net decrease in flood storage capacity caused by the Revised Charles River Crossing will make no difference to flood levels, which are maintained by the dam between ordinary low water (102.4 feet) and the 100-year flood level (104.3 feet).

However, the one pier in the river required to support the bridge (one large one to the north) in the Revised Charles River Crossing will occupy approximately 1,340 cubic feet of flood storage capacity, the volume between 102.4 and 104.3 feet, far less than the 2,993 cubic feet reported for the FSEIS/R Proposed Action. With the removal of existing I-93 piers, there will be a net increase of 200 cubic feet of flood storage capacity in the Charles River.

The Revised Charles River Crossing will require filling a portion of the Millers River and, therefore, the temporary loss of an undetermined amount of flood storage capacity. This will not change flood levels in the river system, however. Compensation will be provided for, as necessary, all flood storage area lost as a result of the project. This compensatory area could be provided by moving banks or by the creation of a new water feature in the vicinity of the Millers River such as reuse of the graving basin (see Section 4.1.1(b)). This activity will be an integral portion of a projectwide Wetlands and Waterways Mitigation Program aimed at providing replication and replacement of wetland and waterways resources impacted by the project.

3.15 Vegetation And Wildlife

There is no significant terrestrial vegetation in the Area North of Causeway Street to support wildlife population. Therefore, no significant impacts to terrestrial vegetation and wildlife in the FSEIS/R Proposed Action are reported in the Charles River crossing area, and none are expected to occur as a result of the Revised Charles River Crossing.

Chapter 4

CHANGES IN TEMPORARY CONSTRUCTION PERIOD IMPACTS OF REVISED CHARLES RIVER CROSSING

Chapter 4 describes temporary impacts during construction of the Revised Charles River Crossing in the Area North of Causeway Street in comparison to those of the FSEIS/R Proposed Action. The impact categories are the same as those in Chapter 3 with the addition of construction plan, materials disposal, and relocation requirements.

4.1 Construction Plan

This section describes the expected construction methods to be used in the Area North of Causeway Street and their potential environmental impacts.

4.1.1 River Tunnel

The Revised Charles River Crossing will include a three-lane tunnel traversing under the Charles River from a point just north of Leverett Circle on the south bank to the riverfront area of eastern Cambridge on the north bank. Test borings in the vicinity of the alignment have been conducted as a part of previous independent geological investigations in support of other projects. Test boring data is known to be inadequate for detailed design and additional boring work will be undertaken. Boring data indicates that bluish gray moderately hard argillite will be encountered approximately 70 feet below existing ground on the Leverett Circle riverbank. This bedrock is overlayed with overburden measuring approximately 40 feet in depth. This is comprised of layers of fill/organic silt mix, silt, medium clay and glaciomarine deposits. Less specific information is available about the alignment near the north bank of the river. Generally, it is know that the upper layer of bedrock is often highly weathered and of poor quality, and that the bedrock is shallow on the north bank of the river near the bascule bridge and is covered with a thin layer of overburden.

4.1.1(a) Construction Methods Considered

To quantify impacts and to address concerns it is first necessary to identify the most likely method of constructing the Charles River tunnel. Prior to concluding that immersed tubes would be used, various methods of tunnel construction were considered including:

- tunneling
- staged cofferdam construction
- immersed tube
- combination tunneling/cofferdam

The tunneling and combined tunneling/cofferdam methods, which include use of tunnel boring machines, conventional mining techniques, and NATM (New Austrian Tunneling Method) were determined to be infeasible because of the level of risk. The unacceptable level of risk was due to the variation in soundness of the underlying rock, the inadequate crown-cover of rock over the tunnel section, and the highly variable depth to rock across the river.

The staged cofferdam system considered consists of cellular sheet pile cofferdams constructed in two stages, allowing the maintenance of navigation in half the waterway during construction. The work in each stage consists of cofferdam installation, dredging, blasting, rock removal, tunnel construction, backfill, and cofferdam removal. The primary concern with the staged cofferdam method is the blasting and rock removal phase. The rock boring data indicates a highly variable condition in this area. Fractures, fissures, water-bearing seams, joints, intrusions, and layers of decomposition can be interpreted from the available data and can be anticipated from the general characteristics of the weathered argillite encountered throughout the Boston area. These conditions would tend to make cofferdam installations unstable. Cofferdam rock foundations would be subject to failure under the unbalanced hydrostatic pressures. Remedial measures such as grouting, rock bolting, shoring, and bracing could be implemented. However, the level of risk associated with this method would still be unacceptable. This method is, therefore, not considered a viable method of construction.

4.1.1(b) Recommended Construction Method

Immersed tube float-in sections could be constructed of either steel or concrete. Prefabricated floating concrete or steel tube sections are precluded by the restriction of the new Charles River Locks and Dam . On-site steel fabrication would require the construction of a major fabrication facility near the Charles River Basin. This could be accomplished in the area west of the bascule bridge or possibly on barges located in the waterway just east of the Museum of Science. The area requirements for this facility, as well as environmental, logistical, cost, and scheduling considerations, make this an impractical approach. A concrete casting basin, similar to the one proposed for the Fort Point Channel crossing, could be used.

The concrete casting basin would not be constructed within the alignment of the tunnel and would have to be constructed on private property, solely for the purpose of fabricating the concrete tubes. The area west of the MBTA Commuter Rail lines is of adequate size and proximity to be used as a casting basin site. An area of approximately 180 feet by 430 feet (or 100 feet by 790 feet) and 50 feet deep, requiring the removal of approximately 145,000 cy of material, would be required for the basin. A cofferdam comprised of circular cells approximately 50 feet in diameter would be required to form a water seal access point between the casting basin and the Charles River. Following completion of the construction of the tube sections and the installation of temporary bulkheads, the cofferdams at the water access side of the casting basin would be breached and the tube sections floated into position for sinking into the prepared tunnel trench. Dredging of access channels for the tunnel sections would be required in the Charles River between the casting basin and the proposed tunnel location.

Preparation of the tunnel trench to receive the immersed tubes would consist of dredging and blasting within the river area. Various tunnel activities would have to be staged and incorporate seasonal constraints or limitations to allow for maintenance of navigation and to minimize the impacts on anadromous fish.

4.1.1(c) Potential Construction Techniques To Minimize Environmental Impacts

There are various environmental impacts or concerns associated with the tunnel trench excavation and various construction methods or techniques are available to minimize impacts. Sediment and turbidity would be controlled by positive containment measures. Silt curtains in conjunction with other positive containment methods would be required. This zone would include the excavation limits, the rig barge, the material barge, and the full swing of the dredging equipment. Dredging would not be permitted during periods of known fish runs or spawning periods, or during other environmentally sensitive periods (see section 4.14.3). The contractor would be required to use environmentally sound construction methods. This would be controlled through review and approval of required submittals. Construction control methods would include but not be limited to monitoring water quality and revising operations if water quality levels become unacceptable.

Currently, project construction is underway for the I-90 tunnel under Boston Harbor. The immersed tube tunnel contractor is required to provide a fisheries biologist to monitor fish runs in the Harbor. A similar requirement could be included in the permit process for the Charles River tunnel.

A large portion of the river bottom consists of a thick layer of material over bedrock. In this area the stability of the tunnel and increased turbidity resulting from excavation would be a concern. The tunnel trench side-slopes could become very flat if not retained. In these areas, the tunnel trench walls would be retained by a excavation retention system, details of which will be developed during final design. The system is envisioned at this time to consist of a sheet pile, master pile arrangement with the master pile bearing below tunnel subgrade.

4.1.2 Landside Tunnels

The Revised Charles River Crossing will include construction of tunnel approaches (Ramps C-T and S-N,) to the Charles River tunnel, and construction of tunnel sections for ramps CN-S and S-CS. Ramp CN-S will be tunnel carrying traffic from the Central Artery northbound to Storrow Drive and Leverett Circle. Ramp S-CS will carry traffic from Leverett Circle and Storrow Drive to the Central Artery southbound.

During construction of the land-based tunnels, every measure will be made to minimize impacts to residential land use in the West End, (i.e., the 1,400 units associated with Whittier Housing, 151 elderly units at the Amy Lowell house, and the 600 parking spaces associated with the health club on Martha Way and access to the Nashua Street Jail). This will be accomplished in part by investigating the potential to coordinate the construction of the MBTA Green Line portal with its interface with the Central Artery/Tunnel Project. The project will coordinate with MGH and Massachusetts Eye and Ear Infirmary during the construction staging to minimize potential disruption.

4.1.2(a) Recommended Construction Method

The construction method for landside tunnels will be cut-and-cover. Excavation support systems will be used for all tunnel sections south of the Charles River and for a portion of those tunnel sections north of the river. The support systems will be either reinforced slurry walls, steel sheet piling, or soldier piles and lagging. Soldier piles and lagging would not be used for deep excavations where the groundwater level is high.

Ramp S-N/S-CS will pass below the Registry of Motor Vehicles building, requiring the underpinning of the building. Underpinning would most likely involve digging jacking pits under the pile caps of the building and jacking sections of steel pipe to bearing below the tunnel subgrade. The tunnel would be constructed with the piles projecting through the tunnel box. The pile loads would then be transferred to the tunnel roofs, which would be designed to support these loads.

Ramps S-CS, C-T, and CN-S will also pass below the MBTA Commuter Rail railroad tracks. Tunnel work across the tracks would be staged taking several tracks out of service at a time. Additional tracks would be installed to replace tracks taken out of service on the MGH development parcel. These replacement tracks would be located west of the existing tracks and at least two could be permanently constructed and left in place after construction as an improvement to North Station. Tunnel construction would progress across the tracks in stages in either a cut-and-cover fashion using an excavation support system and bulkhead walls or by staging an underpinning scheme across the tracks.

The Charles River bridge will carry a total of ten lanes, four Central Artery through lanes both northbound and southbound and two lanes for the I-93 southbound off-ramp (Ramp N-S) to Leverett Circle/Nashua Street. The structure will be a two-span cable-stayed bridge with two lines of stays and a single tower. The main span will traverse the Charles River measuring in excess of 800 feet. The anchor span will be to the north of the main span, and the tower will be located adjacent to the north bank of the Charles River with the foundation partly on land and partly in the waterway.

4.2 Materials Disposal

Construction of the FSEIS/R Proposed Action in the Area North of Causeway Street is projected to result in the dredging of material from the Millers and Charles Rivers and the excavation of landside material in Charlestown/Cambridge.

The construction of the Revised Charles River Crossing will result in additional dredged and excavated materials compared to the FSEIS/R Proposed Action. The addition of tunnels, a ventilation building, and a casting basin for the immersed tube tunnel segment in the Revised Charles River Crossing will increase the quantity of dredged and excavated material to be removed. The categories of dredged and excavated material will be disposed of in accordance to project protocol, which is in the process of negotiation with regulatory agencies. The materials will add to the total volume of material to be disposed in accordance with accepted project standards as described in the following.

4.2.1 Material Quality

Chemical and physical characterization of the excavated and dredged material resulting from the construction of the Revised Charles River Crossing is being finalized. Preliminary studies on the dredged material for the Charles River tunnel alignment concluded that the top 5 foot layer of organic deposits (consisting of organic silt by itself or mixed with organic fill) is contaminated. A relatively small zone of high polychlorinated biphenyl (PCB) and polynuclear aromatic hydrocarbons (PAH) contamination was detected in the sediments of the Charles River. The levels of PCB contamination detected were at or above the levels which would require that the disposal of these sediments be regulated under the Federal Toxic Substances Control Act. Further characterization of this material is being finalized.

Small portions of the sand deposits found between the silt/fill layer and the native material (sand and gravel, clay, till, or bedrock) layer in the Charles River were found to be contaminated with moderate amounts of lead, arsenic, and mercury. Characterization results for the excavated material and additional dredged material are being finalized and will be assessed for beneficial reuse or disposal options.

4.2.2 Beneficial Reuse Or Disposal Options

The Materials Disposal chapter of the FSEIS/R described a Materials Disposal Plan which maximized the beneficial reuse of excavated and dredged material. Beneficial use refers to the use of excavated and dredged materials in a manner that ultimately benefits the natural environment. As proposed in the FSEIS/R and selected as a part of the Proposed Action for materials disposal, the beneficial use of excavated material includes the use of processed historic fill as backfill along the project alignment or as daily cover at existing Massachusetts landfills. Excavated project historic fill will also be used in the landfill closure and capping activities at Spectacle Island. The beneficial use of excavated native clay and till to cap Massachusetts landfills was also described in the FSEIS/R. The disposal of acceptable dredged material at the Massachusetts Bay Disposal Site (MBDS) also has beneficial effects in that clean dredged material may actually cap contaminated sediments presently existing at the MBDS. Disposal, as described in the FSEIS/R, refers to the ultimate disposal of excavated and dredged material. The modifications to the proposed Materials Disposal Plan resulting from the construction of the Revised Charles River Crossing will follow the same planning process.

Clean native dredged material will be disposed of at the MBDS. Disposal site options for unacceptable dredged material will be analyzed following the methodology outlined in the FSEIS/R. A suitable disposal option will be selected and ultimately approved by DEP. As noted previously, a small amount of organic deposits along the Charles River tunnel may be subject to regulation under the Toxic Substances Control Act, and this material will be properly disposed of in accordance with regulatory requirements.

The increased volume of excavated material (historic fill and unsorted clay and till) will be beneficially reused as either backfill along the Area North of Causeway Street alignment (suitable granular historic fill) or processed for use as daily cover at Massachusetts lined landfills (suitable nongranular historic fill). In order to reduce the total number of truck trips within the construction area, which could potentially affect the surrounding residential neighborhoods in Cambridge, Somerville, and Charlestown, the Department is investigating the feasibility of siting and operating a materials processing operation in Cambridge accessible by barge to process excavated historic fill for beneficial reuse as either backfill or daily cover. A map showing possible locations is shown in Figure 4.1.

Native Boston blue clay would be distributed to Massachusetts municipalities for use in landfill closure activities. The project is currently working in conjunction with DEP to identify priority municipal landfills to receive excavated clay.

4.3 Transportation And Traffic

Because of the design changes in the Revised Charles River Crossing, the detailed traffic management plans such as those provided in the FSEIS/R are under development. These plans will be developed to the degree provided in the Maintenance of Traffic Appendix when the Revised Charles River Crossing proceeds from conceptual design to the 25 percent preliminary design level.

The FSEIS/R Maintenance of Traffic Plan envisions an interim opening of the CANA project with connections to the existing I-93 mainline. The use of the CANA City Square tunnels and associated loop ramps would eliminate the substandard weave and merge on the existing I-93 high bridge over the Charles River, thereby improving mainline operation. This would reduce, during the peak of Central Artery construction, the tendency of marginal traffic to divert to the local street system in the Area North of Causeway Street because of severe congestion.

The Department intends to provide an interim CANA opening. The Department plans to complete a temporary Tobin Bridge to Central Artery (T-C) loop ramp and a Central Artery to Tobin Bridge (C-T) loop ramp as part of the CANA project to permit both inbound and outbound regional traffic movements between the Central Area and the new City Square tunnels. This would permit the CANA project to open in 1994 and assist in mitigating the traffic impacts of Central Artery construction in the area.

Construction will be further staged to permit an early opening of the Charles River tunnel to divert traffic from Leverett Circle during construction and to facilitate the opening of the I-93 northbound mainline first by constructing Ramp CN-S prior to Ramp L-CS.

4.3.1 Potential Traffic Detours

In the FSEIS/R Maintenance of Traffic Plan Appendix, five specific traffic detours are discussed for the Area North of Causeway Street. To the extent that it can be presently determined based on the current level of design, the Revised Charles River Crossing will have the following impacts:

Temporary CANA Connections With I-93. As discussed above, the Department remains committed to the construction (as part of CANA) of temporary loop ramps to accommodate traffic between the CANA City Square tunnels to the I-93 mainline.

Leverett Circle Connection Detour. The Revised Charles River Crossing will not permit the independent construction and early opening of the Leverett Circle connector roadway as presently envisioned. The inbound roadway, while still on a viaduct, will be part of the I-93 mainline bridge crossing the Charles River and, therefore, cannot be independently constructed. The outbound roadway will be in a tunnel which will be dependent on the opening of the I-93 northbound mainline for use. The existing double-decked Leverett Circle connector will remain in service as needed.

Storrow Drive Detours. It is expected that this impact will still occur, with details to be determined, as design progresses.

I-93 Bent Modification Detours. It is expected that this impact will still occur, with details to be determined, as design progresses.

Leverett Circle Connection Bent Modification Detour. It is expected that this impact will still occur, with details to be determined, as design progresses.

In addition to these impacts in the Area North of Causeway Street, it can be expected that modifications to construction staging and traffic management will also be required in the area from the Callahan and Sumner Tunnels to Causeway Street due to the redesigned tunnel ramp system in this area.

4.3.2 Parking Facilities

Construction of the Revised Charles River Crossing will eliminate 104 additional parking spaces, compared to the FSEIS/R Proposed Action. These spaces are in the lot owned by the Commonwealth located immediately west of the Spaulding Rehabilitation Hospital on Nashua Street. A Massachusetts Aeronautical Commission helipad is also located on this parcel. Compensation for this loss will not be provided by the Department. Other parking impacts in the Area North of Causeway Street, as identified in the FSEIS/R, will remain the same in terms of the number of spaces affected and duration of impact, but the years during which these impacts occur will change in accordance with the revised construction schedule.

4.3.3 Public Transportation And Pedestrian And Bicycle Circulation

The Revised Charles River Crossing will require the underpinning of the MBTA Science Park station during construction. Access to the station during construction will be addressed. In addition, North Station Commuter Rail railroad tracks will require underpinning. These issues will be studied in detail during the design process. The Revised Charles River Crossing will have no impacts on other public transportation facilities. Existing pedestrian and bicycle access will be maintained during construction.

4.4 Air Quality

The construction-related air quality impacts are associated with the effects of the detouring and disruption of traffic during construction (mobile source-related impacts — CO sources), and the demolition, land clearing, grading, excavation, and other earthwork activities (fugitive emissions — fugitive dust sources).

These construction-related air quality impacts for the Artery/Tunnel Project as a whole are being evaluated through a series of analyses, pursuant to the Memorandum of Understanding signed by the

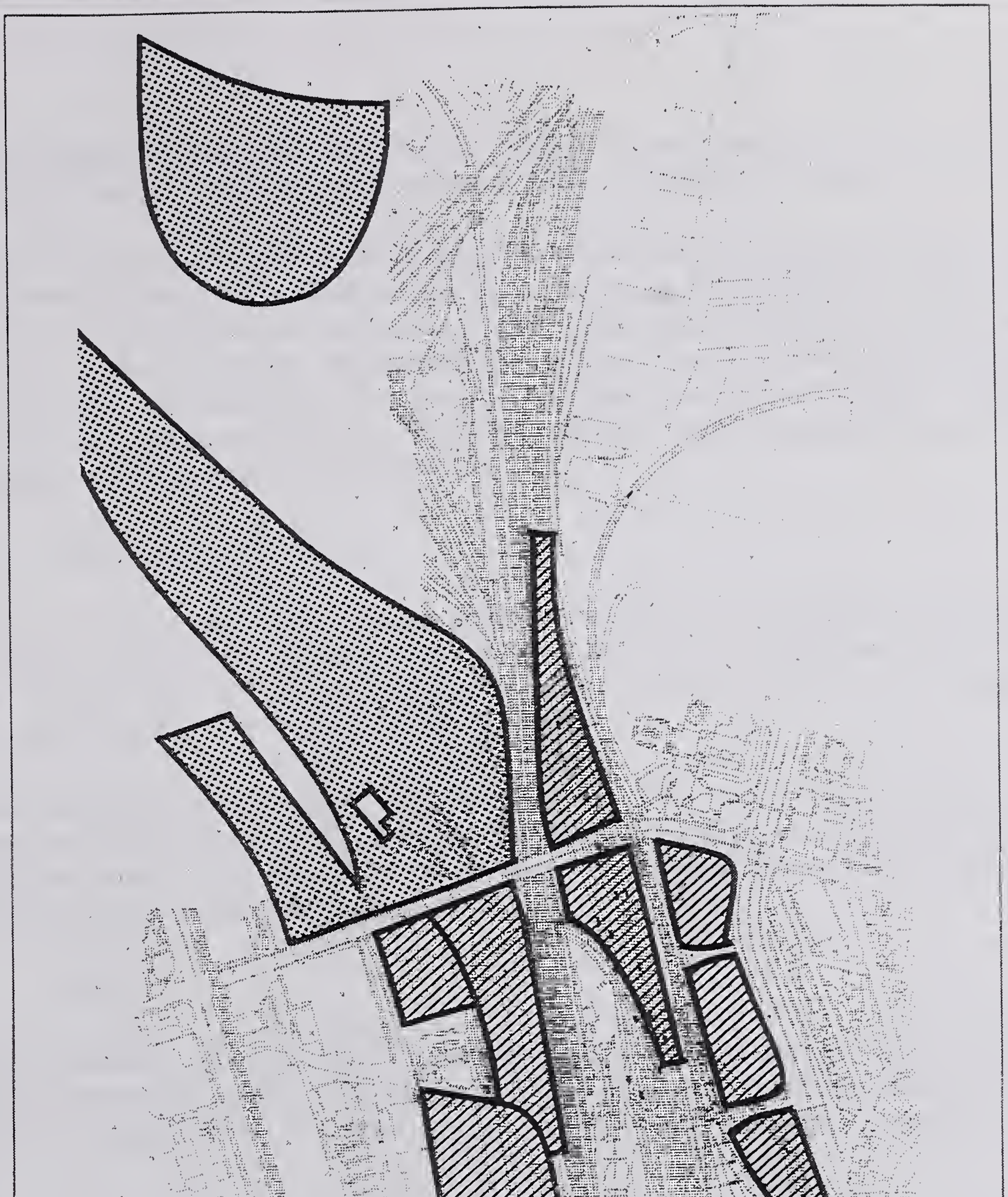

Figure 4.1

Locations for Materials Processing Operations.
Revised Charles River Crossing.

Massachusetts Highway Department, the Federal Highway Administration, the U.S. Environmental Protection Agency, and the Massachusetts Department of Environmental Protection.

These analyses include a process to estimate traffic volumes at specific locations during construction, to estimate CO levels at intersections likely to be affected by construction detours and truck routing, to estimate areawide emissions, and to analyze construction-related fugitive dust near major construction sites. The committee that includes the above agencies meets on a regular basis, to discuss study methodology, results, and mitigation measures to minimize potential air quality impacts during construction. To date, construction scenarios for 1992/93 have been analyzed, and an assessment of future major stages of construction is planned for analysis.

4.5 Noise And Vibration

Construction period noise and vibration impacts will be associated with tunnel construction near sensitive land uses. However, where the land use will be changed from long-term care facility at the Spaulding Rehabilitation Hospital site to future open space land use, construction-related noise impacts will be reduced substantially in the Area North of Causeway Street.

As noted in the FSEIS/R Proposed Action, mitigation measures are available to reduce noise and vibration impacts associated with the operation of construction equipment, and these measures will be implemented. Construction contractors in this area will be required to comply with applicable State and local noise ordinances as they are throughout the entire project area.

4.6 Energy

The primary revisions to the FSEIS/R Proposed Action involve replacing ramps carried by bridge structures with a series of tunnels. The construction of tunnels is more energy-intensive than that of bridges and would increase the total onetime, nonrecoverable amount of energy required to construct the project.

4.7 Economic Characteristics

Qualitative construction impacts of the project on the economic characteristics of adjacent neighborhoods and established business districts are described in the FSEIS/R Construction Appendix. Some of the details of construction may vary in some neighborhoods and business districts as a result of the design change, and their effects will depend on final design and the development of specific mitigation strategies. Overall, the qualitative impacts as described in the FSEIS/R are still essentially valid. As details of construction staging are further refined, more information will be provided. This has been accomplished as final design has proceeded in other segments of the project.

4.8 Land Use And Neighborhood Characteristics

Changes in construction period impacts relate primarily to the tunnels in the area around North Station and the new Boston Garden site. The construction of tunnels CN-S and C-T in the Revised Charles River Crossing will require coordinating service access to the Garden. Construction impacts north of the river will affect the area of Cambridge west of the bascule bridge primarily because of the graving basin and river tunnel; construction impacts on Charlestown will be considerably reduced because of fewer viaducts.

4.9 Relocations

The Revised Charles River Crossing, in comparison with the FSEIS/R Proposed Action, will result in the displacement of the Spaulding Rehabilitation Hospital on Nashua Street and the Boston Thermal Minot Station steam generating plant described in Section 3.11.2. Relocations will be carried out in accordance with Public Law 91-646, in accordance with Artery/Tunnel Project procedures. The Revised Charles River Crossing will not result in any residential relocations.

4.10 Parklands

Principal differences in impacts on parklands in the Revised Charles River Crossing compared to the FSEIS/R Proposed Action are due to construction of the tunnel under the Charles River and the western end of the Nashua Street parcel. A portion of the Charles River recreation area (i.e., the river surface) will be disrupted for approximately 2 years as the tunnel is being constructed. Navigation of recreational boats through this portion of the river will be maintained, however.

Development of the park on the former GSA parcel on the north bank will not be affected although tunnel construction will occur within 50 feet of the southern corner of the parcel.

Paul Revere Landing Park, north and south bank portions, will be affected by construction in generally the same manner and degree as in the FSEIS/R Proposed Action. Full restoration of the Paul Revere Landing Park north bank portion may be delayed by an additional year, based on the overall schedule for the Revised Charles River Crossing.

4.11 Historic Resources

Changes in temporary construction period impacts of the Revised Charles River Crossing on historic resources are identified below.

4.11.1 Tower A

The Revised Charles River Crossing will not affect Tower A. The FSEIS/R Proposed Action includes spanning Tower A with Ramp T, with probable roof modification. Under the CANA project connection to the FSEIS/R Proposed Action, Tower A is to be demolished.

4.11.2 Charles River Basin District

The Revised Charles River Crossing will have no temporary construction period impacts to the historic attributes of the Charles River Basin District, with the exception of potential vibration and soil movement impacts to the historic Street Railway Viaduct. These impacts will be the same as those described for the FSEIS/R Proposed Action.

4.11.3 100 Nashua Street

The Revised Charles River Crossing will have temporary construction period impacts upon the Registry of Motor Vehicles building at 100 Nashua Street. Location of the Leverett Circle/Storrow Drive to I-93 and local to I-93 southbound movement in two-lane tunnel under the building will require underpinning and stabilization of the historic facade. The FSEIS/R Proposed Action requires sheet piling within 30 feet of 100 Nashua Street for construction of the eastbound ramp, even though no tunnel is included.

4.11.4 Causeway/North Washington Streets District

The Revised Charles River Crossing will have no new construction period impacts to the Causeway/North Washington Streets District. As with the FSEIS/R Proposed Action, construction period impacts are associated with the construction of the northbound I-93 mainline.

4.11.5 Charles River Railroad Draw 1

The Revised Charles River Crossing will not have any temporary impacts to Charles River Railroad Draw 1 related to the dredging of the Charles River tunnel. The FSEIS/R Proposed Action has no construction period impacts upon Charles River Railroad Draw 1.

4.12 Archaeological Resources

There will be no construction period impacts to archaeological resources.

4.13 Utilities

The most important change with the Revised Charles River Crossing will take place in the Leverett Circle area, where substantial utilities relocation work is required, and additional temporary relocations may be necessary. Another critical item will be the location of the graving basin for the casting of the sunken-tube tunnel sections; which will require the relocation of a 96-inch force main.

4.14 Water Quality And Fisheries

This section compares construction period impacts of the Revised Charles River Crossing with the FSEIS/R Proposed Action.

4.14.1 Bridge Piers

There will be 10 fewer piers to construct in the Charles River for the new bridge design; therefore, overall construction impacts in the water will be less for piers located in the river. Footing installation will be accomplished inside sheet pile cofferdams. Steel sheet pile will be driven well below the river bottom. Next, a clamshell will dredge out the material within the sheet pile cofferdam down to a level which is suitable for the pier foundation.

A tremie concrete pour will serve as a structural seal for the bridge foundation. The pier substructure below water will then be constructed in the dry within the cofferdam. Once construction progresses above the water line the cofferdam will be removed.

4.14.2 River Tunnel

The tunnel construction will require dredging in the Charles and Millers Rivers. Dredging and removal of the existing I-93 bridge piers down to the mudline will cause some turbidity. To keep it to a minimum, the contractor will use control measures to minimize turbidity, such as turbidity curtains, and monitor water quality on a regular basis.

Upon completion of the project, levels of suspended particulates and turbidity are expected to return to normal levels.

4.14.3 Fisheries

Bridge construction for the Revised Charles River Crossing will have similar yet reduced effects on water quality because of the fewer number of cofferdams that would require dewatering. Fine materials suspended in the water column during dewatering could affect the survival of larval fish as well as the plankton on which they depend. Because of such effects to aquatic resources (in part), the dispersal of suspended materials will typically be controlled during dewatering operations by use of silt curtains, or the use of specialized dredging equipment. The Revised Charles River Crossing will present less impact to the aquatic environment during bridge construction than the FSEIS/R Proposed Action.

Tunnel construction for the Revised Charles River Crossing will include dredging, blasting, screeding, and backfilling operations. These operations can all potentially affect water quality (discussed above) and/or fish directly. Appropriate control of suspended sediments resulting from dredging and filling operations can minimize impacts to water quality, thus reducing any possible effect on fish populations.

Blasting operations, however, can have immediate effects on fish in the vicinity of the blast. Species most likely to be affected would include those which are attracted to the drill/blast operation, for example, those seeking cover or shade beneath the barge. Disturbance of the area immediately adjacent to the boreholes where explosive charges are placed would likely cause most fish to leave. A variety of measures also can taken to minimize effects to species attracted to the blasting area.

Blasting effects were assessed and contingency plans successfully implemented to protect schooling and anadromous fish potentially affected by construction of the trench for the I-90 tunnel. During tunnel construction operations, for example, efficient control of blast energy (such as efficient charges, and stemming the boreholes) reduces the energy released to the water column, thus minimizing the effect on fish. It was also determined that anadromous fish (alewife) could be "startled" from the blast area before detonation using high-frequency sound. The use of sonar to "see" fish beneath the drill barge and near (up to 600 feet) the blast area successfully minimizes impacts to the Harbor fishery. These measures may also be used during the blasting operations for the Revised Charles River Crossing.

It is expected that by controlling dewatering operations and by implementing mitigation measures for blasting operations, the Revised Charles River Crossing will have only minimal impact to the warm water and anadromous fishery of the Charles River.

4.15 Wetlands And Waterways

4.15.1 Wetlands

The dredging and blasting of the Charles River will be required to position and place the immersed tube tunnel (Ramps C-T/S-N), and dredging at the southern end of the Millers River will be required to build the continuation of the tunnel[1] along the north bank of the Charles River. Temporary alterations on both sides of the existing banks of the Charles River will result from the construction of the tunnel crossing. Additional temporary alterations to the northern bank of the Charles River will result from the construction of a casting basin in eastern Cambridge, west of the bascule bridge where the immersed tube tunnels will be fabricated. These banks are comprised of seawalls which will be reconstructed upon completion of construction. Temporary effects to Land Under Water will occur as a result of constructing the pier foundations for the I-93 bridge crossing in the Charles River. These areas will be confined with sheet pile cofferdams to minimize impacts to wetlands resources during construction. These are the principal design components of the Revised Charles River Crossing which will lead to the major differences in the construction period impacts in comparison to the FSEIS/R Proposed Action.

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[1] Just ahead (west) of the Millers River the tunnel carrying Ramps C-T and S-N splits to allow the S-N movement to exit right before arcing north to merge with I-93 NB.

Several hundreds of thousands of cubic yards (cy) of material will be dredged for the Charles River tunnel and associated channel required to move tunnels into position from the adjacent casting basin. A segment of river will be cleaned up by the removal of a layer of bottom sediments for tunnel construction.

Anadromous fish runs typically are most active in the spring, between March 15th and June 15th. Dredging in a fish run during this time period is prohibited by the Massachusetts Wetlands Protection Act regulations, unless allowed by the Massachusetts Division of Marine Fisheries (DMF). The DMF may allow dredging during this period if adequate measures are taken to protect migrating fish, as is being done during the Harbor tunnel construction. Positive containment of the dredging operations in the Charles River will make it possible to construct the immersed tube tunnel sections of the Revised Charles River Crossing with minimal harm to the fisheries value of the river.

Turbidity caused by dredging in the river will be positively managed in order to avoid undue adverse impacts to the fisheries habitat value of the river (see Section 4.14).

As is the case with the FSEIS/R Proposed Action, the footings and piers required to support the bridges and viaduct portions of the Revised Charles River Crossing will cause temporary construction period impacts to wetlands resource areas. These impacts will be substantially less due to fewer piers in the Charles River. Table 4.1 compares the temporary construction period impacts of the Revised Charles River Crossing with those of the FSEIS/R Proposed Action for each of the State wetland resource categories.

4.15.2 Waterways

Because the design will include tunnel crossings of the Charles and Millers Rivers, temporary construction period impacts to waterways interests resulting from the Revised Charles River Crossing will be more extensive than those which would result from the construction of the FSEIS/R Proposed Action. To maintain a safe and secure construction site it will be necessary to preclude public access to areas which are actively under construction, or which are being used for equipment and materials stockpiling (laydown areas) or access to the area of the work. This will mean that, for the duration of construction in an area, the public's already limited access to the waterfront and its enjoyment thereof may be restricted. A casting basin will be constructed on the north side of the Charles River which will prohibit access during construction.

Upon completion of work on the south bank of the Charles River, there will be no visible components of roadway (except the ventilation building and stacks, and perhaps an emergency egress) and the restored surface will be suitable for the development of park and recreational uses in accordance with the Lower Charles River Basin master plan currently under development by the MDC. Similarly, completion of the Charles River tunnel on the north bank will leave a restored ground surface suitable for recreational developments in accordance with the approved master plan for mitigation.

In contrast to the FSEIS/R Proposed Action, the Revised Charles River Crossing will include the construction of tunnels on the south side of the river (Ramps S-CS, CN-S, and C-T) through the MBTA and Amtrak railroad yards, beneath 100 Nashua Street and beneath Spaulding Rehabilitation Hospital. Construction of these components of the Revised Charles River Crossing may restrict the public's access to and use of the waterfront in this area and may require close coordination with the construction of developments at North Station for which Chapter 91 Licenses already have been issued.

During the construction period visual access to the waterfront will be impaired from a number of vantage points for both the Revised Charles River Crossing and the FSEIS/R Proposed Action. Obstructions will include materials stockpiles and cranes and other pieces of large construction equipment required to build the project, particularly the bridge and viaduct segments.

4.15.3 Navigation

Bridge and tunnel construction in the Charles River will be coordinated to minimize navigation impacts. The 1,000-foot distance between the bridge pier structure and the northern terminus of the tunnel is sufficient to create safe passage for vessels, between the two construction sites.

4.15.3(a) The Charles River Crossing: Bridge

The Revised Charles River Crossing will require construction of one pier structure in the Charles River waterway compared to 11 in the FSEIS/R Proposed Action. As a result, the process to notify mariners will be simplified. The time required for the construction of the one pier (a large one on the north side of the river) will be about half the time described in the FSEIS/R for all 11 piers.

The pier structure will require the installation of a cofferdam extending above the water line only during construction of the foundation. It is anticipated to take 6 months to complete the pier foundation work. The cofferdam and construction equipment, including the barges for transporting material dredged for pier construction will intrude into the navigation area. However, this obstruction will occur at one of the wider portions of the navigation area, thereby minimizing the impact on navigation. The Revised Charles River Crossing will include a tunnel upriver of the bridge pier, which will require barges to transport dredged material from the tunnel alignment downriver to the locks. The commitments to maintain navigation during construction zone, as stipulated in the FSEIS/R, will be followed.

The amount of material dredged to accommodate the pier construction will be less than in the FSEIS/R Proposed Action because of fewer piers. As the design for the bridge is developed, the amount of dredging, the location of the disposal site, and the number of barge movements to transport the excavated material will be ascertained. Even with the additional barges required for the Revised Charles River Crossing, traffic on the Charles River will not be disrupted significantly. A Departmental analysis of Charles River traffic, Maintenance of Barge Traffic Through the Charles River Lock and Dam, 1988, indicates that there is little commercial traffic on the river and the recreational traffic occurs primarily on weekends when barge movements are unlikely to occur.

4.15.3(b) The Charles River Crossing: Tunnel

Tunnel construction with the Revised Charles River Crossing will affect the free flow of vessels in the waterway. The immersed tube tunnel construction method will entail dredging, blasting, the preparation of the tunnel foundation, tube transport and placement, and backfill. Caissons and steel sheet piling may be installed prior to dredging to facilitate tunnel construction. Silt curtains will be deployed as necessary to address turbidity. In addition, cofferdams will be constructed at either end of the tunnel to facilitate the connection between the immersed tube and the landside tunnel sections. The contractor will be required to prepare a Navigation Plan and Blasting Plan with details concerning periods of interrupted flow of vessels. These plans will detail the schedule and the methods that will be employed to minimize impacts on navigation for both recreational and commercial traffic. These will be submitted to regulatory agencies and the port community for their review.

The dredging required to accommodate the tunnel will result in an increase in barge traffic over the FSEIS/R Proposed Action. However, the increase will not be significant. Early estimates of amounts of dredged sediment and rock are unknown.

There will be changes in temporary construction period impacts to navigation because of tunnel construction. However, with the exception of conditional passage during certain construction activities

TABLE 4.1

COMPARISON OF FSEIS/R PROPOSED ACTION TO REVISED CHARLES RIVER CROSSING TOTAL CONSTRUCTION PERIOD IMPACTS TO WETLANDS RESOURCE AREAS

Wetland Resource Category	Locus	Project Purpose	FSEIS/R Proposed Action	Revised Charles River Crossing
Banks	Millers	Cofferdams (Footings)	120 lf	0 lf
		Permanent Piers	40 lf	0 lf
		Temporary Piers	20 lf	N/A
		Surface Roads/Tunnel/	N/A	2200 lf
			100 lf	0 lf
	Charles	Cofferdams (Footings)	N/A	250 lf
		Tunnel	10 lf	0 lf
		Piers	N/A	200 lf
		Casting Basin		
Land Under Water	Millers	Cofferdams (Footings)	8646 sf	0 sf
		Permanent Piers	1496 sf	0 sf
		Temporary Piers	500 sf	N/A
		Surface Roads/Tunnel/ Vent Building	N/A	60,000 sf
	Charles			
		Cofferdams	18,500 sf	14,000 sf
		Tunnel [1]	N/A	140,000 sf
		Piers	3500 sf	700 sf
Bordering Vegetated Wetland	Millers	Footings	0 cf	0 cf
		Piers	0 cf	0 cf
		Surface Roads	N/A	200 cf
Bordering Land Subject to Flooding [2]	Millers	Cofferdams (Footings)	7200 cf	0 cf
		Piers	1231 cf	0 cf
		Surface Roads	N/A	50,000 cf
	Charles	Cofferdams (Footings)	14,800 cf	12,000 cf
		Piers	1250 cf [3]	-1,000 cf [3]

N/A: Not Applicable

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[1] Includes dredging, blasting, and circular cofferdams on both banks.

[2] Includes watersheet of Millers and Charles Rivers. Temporary watersheet impacts not quantified in FSEIS/R.

[3] Includes removal of 1,540 cf of existing I-93 piers from the Charles River.

such as tunnel tube placement, construction of the Charles River tunnel will occur with the same commitments and safeguards to construction period navigation set forth in the FSEIS/R.

Chapter 5

CHANGES IN PERMITS/APPROVALS OF REVISED CHARLES RIVER CROSSING

The new permits required because of the Revised Charles River Crossing will be for the potential steam plant relocation and the ventilation building. Otherwise, there will be no change in the types of permits required because of the Revised Charles River Crossing. The following permits will still be required by Federal, State and local agencies.

5.1 Federal Agencies

5.1.1 Environmental Protection Agency

A projectwide National Pollutant Discharge Elimination System (NPDES) permit application for construction activities has been submitted to the Environmental Protection Agency (EPA). A permit has been issued by EPA on September 30, 1991, pursuant to the Clean Water Act, 33 U.S.C. Sec. 1342, which regulates the discharges of pollutants from stormwater runoff and dewatering into waters of the United States from the project during its construction. In addition, an NPDES permit for the design contracts in the Charles River area may be required for discharge of project stormwater to the existing drainage system. Design of the discharge structure will need to incorporate control conditions. Stormwater runoff containing salt from deicing agents will be discharged downstream of the Charles River dam to Boston Harbor.

5.1.2 Federal Aviation Administration

Federal Aviation Administration (FAA) Form 7460-1, Notice of Proposed Construction or Alteration, will be required in accordance with 14 CFR Part 77 Subchapter B for all applicable construction or permanent alterations. The permit is used by the FAA to determine impacts to navigational air space.

5.1.3 U.S. Army Corps Of Engineers

The placement of fill or structure in waters of the United States including the Charles River and the Millers River requires a Department of the Army Permit issued by the USACE. The proposed filling of Federal jurisdiction wetlands in the Millers River will be reviewed under the Section 404 (b) (1) guidelines for determining the least damaging practicable alternative. Possible routes have been studied and will be presented under the Highway Methodology to select that practicable alternative and plan minimization and mitigation measures to reduce unavoidable impacts.

5.1.4 U.S. Coast Guard

In accordance with the Federal Acts pertaining to bridges including Section 9 of the River and Harbors Act of 1899 and the General Bridge Act of 1946, any plans to construct a bridge will require a USCG Bridge Permit.

5.2 State Agencies

5.2.1 Department Of Environmental Protection, Division Of Water Pollution Control

A Groundwater Discharge Permit in accordance with 314 CMR 6.00 from the Department of Environmental Protection, Division of Water Pollution Control (DEP/DWPC) will be required for any proposed discharges to the groundwater resulting from construction.

A Water Quality Certification will be required as part of the NPDES permit pursuant to Section 401 of the Clean Waters Act and in accordance with 314 CMR 9.00 from the DEP/DWPC.

A Surface Water Discharge Permit in accordance with 314 CMR 3.00 from the DEP/DWPC is identical to and concurrent with the NPDES permit submission. It must be filed with DEP for discharge of stormwater associated with this project element.

A Sewer Extension/Connection Permit will be required from the DEP/DWPC, in coordination with the Boston Water and Sewer Commission (BWSC), to authorize any relocated sanitary drainage connections or lines, as well as tunnel washdown water and any ventilation building sanitary discharge.

5.2.2 Department Of Environmental Protection, Division Of Waterways and Wetlands

A Chapter 91 License from the Department of Environmental Protection, Division of Waterways and Wetlands (DEP/DWW) will be required for placement of fill and/or structure in flowed (i.e., the present channel of the Charles River) or formerly flowed (filled, now uplands) tidelands.

5.2.3 Department Of Environmental Protection, Division Of Air Quality Control

The Department of Environmental Protection, Division of Air Quality Control (DEP/DAQC) requires approval for construction or demolition activities in accordance with 310 CMR 7.00. Air Quality Notification for all proposed building construction (ventilation buildings) will be required.

The DEP/DAQC must review and accept an air quality certificate prior to the construction of any ventilation building demonstrating that the discharge of any ventilation building will meet the National and Massachusetts Ambient Air Quality Standards.

A Comprehensive Plan Approval filed with DEP/DAQC for the replacement of the functions of the Boston Thermal Energy Corporation steam generator plant will be required.

5.2.4 Executive Office Of Environmental Affairs, Office Of Coastal Zone Management

Where Federal permits are required for work in the Massachusetts coastal zone, the Office of Coastal Zone Management (CZM) must issue a consistency determination indicating the project's compatibility with coastal zone management policies.

5.3 Local Agencies

5.3.1 Boston Department Of Environment, Boston Conservation Commission, And Cambridge Conservation Commission

Orders of Conditions from both the Boston Conservation Commission and the Cambridge Conservation Commission will be required for work and fill in jurisdictional resource areas or within 100 feet of Bordering Vegetated Wetland, Land Under a Water Body and Vegetated Bank, pursuant to M.G.L. C. 131, s. 40. The performance standards will be met through the project's areawide wetlands mitigation measures program which includes replication and replacement of wetlands resources lost as a result of project and by providing other water features in the Lower Charles River water basin that will provide enhanced wetlands functions.

Chapter 6

ISSUES SUBJECT TO FURTHER EVALUATION

Chapter 6 identifies issues subject to further evaluation during the subsequent permit and design processes for the Revised Charles River Crossing. Similar issues have been addressed successfully throughout the Artery/Tunnel Project alignment based on continuous design and environmental analyses. Successful resolution of these issues is expected as well.

6.1 Traffic

6.1.1 Changes in Traffic Analysis

The study area traffic network will be extended north along the I-93 corridor to the north of the Mystic Avenue interchange. This will provide more precise data regarding the split of traffic between the expressway and local street approaches to the Charles River crossing from the north.

Changes to other portions of the Proposed Action network, beyond those changes related to the Charles River crossing, will be incorporated as they develop into the Proposed Action. These design refinements have been developed through the preliminary and final engineering efforts which have proceeded since the completion of the FSEIS/R. Evaluation of the impacts of these changes will proceed on a case-by-case basis independent of this NPC for the Revised Charles River Crossing.

Additional intersection operations within the existing study area in Charlestown and east Cambridge will be analyzed.

The project study area will be limited to the following analysis districts from the original study area for the FSEIS/R:

- Government Center
- Financial District
- North End
- North Station
- West End
- Beacon Hill
- Charlestown
- Navy Yard
- E. Cambridge/Somerville

Repeated analyses of Charles River crossing plans during the past 2 years have demonstrated that all plans within the general capacity parameters of the FSEIS/R Proposed Action and the Revised Charles River Crossing do not significantly affect traffic operations outside of these districts.

6.1.2 Additional Traffic Design/Engineering Analysis

The Revised Charles River Crossing carries the potential for the future installation of a northbound HOV lane if deemed necessary by further analyses of traffic conditions north of Sullivan Square. If this is so desired, then the design of the northbound Storrow/Tobin ramp to I-93 northbound will be reviewed.

The Leverett Circle intersection design aspects, traffic signalization, access to Nashua Street from Charles Street Extension, pedestrian paths, and integration with the MBTA'S Green Line Science Park station, will be further analyzed.

Additional analysis of intersection operations will be performed to optimize signalization and traffic flow on surface streets.

Several intersections along New Rutherford Avenue (at City Square, at the Boston Sand & Gravel Access Road, and at the Ramp C-L intersection) will undergo design and traffic signal analysis.

Design of the intersection of the proposed New Sudbury Street on-ramp with New Sudbury and Cross Streets will require additional evaluation.

Design of the merge of the southbound I-93 mainline with the on-ramp from the Tobin Bridge and the end of the inbound HOV lane into the I-93 southbound mainline Charles River bridge crossing will require additional evaluation.

6.2 Air Quality

The Department will undertake a detailed air quality assessment to confirm that the Revised Charles River Crossing will comply with the requirements of the 1990 Clean Air Act Amendments, the Massachusetts State Implementation Plan, and the Massachusetts Ventilation Building certification regulation.

The air quality analysis will include the following:

- An evaluation of CO levels at critical locations that are expected to be affected by these design changes, included but not limited to the ones evaluated for the surrounding area of the FSEIS/R Proposed Action.
- An analysis of the impact on regional levels of CO, hydrocarbons, nitrogen oxides, and particulate matter (PM_{10}).
- An analysis of the impacts associated with the new ventilation building on CO, NO_2, and PM_{10}.
- Both analytical and physical air quality modeling (wind tunnel testing) will have to be performed due to the complexity of the area surrounding the ventilation building (which includes existing and proposed large-scale developments), in order to assure that the ventilation building will comply with the Federal and State air quality requirements.

The detailed scope and extent of this analysis will be determined in conjunction with EPA and DEP.

6.3 Noise And Vibration

All of the monitoring sites that were analyzed for the FSEIS/R Proposed Action will be reevaluated. Additional sites will be selected for noise monitoring, prediction of future noise monitoring, and prediction of future noise levels in areas which would be potentially affected by the Revised Charles River Crossing. FHWA model predictions of noise levels at monitoring locations, due to increase in project size, and whether or not they meet FHWA NAC, are yet to be determined. If criterion exceedences are noted, mitigation measures such as noise barrier walls will be evaluated.

Temporary construction noise impacts will be evaluated because of work near sensitive locations (e.g., Suffolk County Jail, and Bunker Hill Community College recreational facilities).

Operational vibration is not an issue; however, the effect of construction vibration, if any, near the Registry of Motor Vehicles building, and the Suffolk County Jail, for example, will be evaluated.

6.4 Historic Resources

Impacts of the Revised Charles River Crossing on the Registry of Motor Vehicles building at 100 Nashua Street, a National Register Eligible Historic resource, will be evaluated in greater detail as design progresses.

6.5 Wetlands And Waterways

Pursuant to the Wetlands Protection Act and Chapter 91 processes, the construction impacts on wetlands and waterways due to construction of a new tunnel in the Charles River, construction of an adjacent graving basin, and tunnel section storage area will be evaluated further.

The Revised Charles River Crossing concept will be submitted to the USACE to trigger the Highway Methodology review that will be used to select the least damaging practicable alternative for the design elements affecting aquatic resources in the Charles and Millers Rivers. Measures to minimize impacts will emerge from this process resulting in final design.

Mitigation measures and work in the Millers River will be evaluated and presented for approval to appropriate regulatory agencies. The impact of additional construction in waterways and historic filled tidelands (i.e., Chapter 91) will be reevaluated. In addition, construction and operation impacts on navigation in the Charles River will be reevaluated in coordination with the USCG, MDC, Massachusetts DWW, USACE, and other appropriate agencies.

6.6 Materials Disposal

Dredged and excavated material must be removed from the project site and disposed of properly or beneficially, consistent with the overall project Materials Disposal Plan. Boring data of subsurface conditions will be developed in order to estimate relationships between characteristics of excavated and dredged material and suitable disposal sites.